RECONSIDERING MEMORISATION IN THE CONTEXT OF NON-TONAL PIANO MUSIC

Vera Fonte

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ABSTRACT

Performers, pedagogues and researchers have shared interest in the topic of musical memorisation for centuries. A large and diverse body of studies has contributed to the current understanding of musicians' views of performing from memory, as well as the mechanisms governing encoding and retrieval of musical information. Nevertheless, with a few exceptions, existing research is still highly based on tonal music and lacks further examination in the musical world of non-tonality. The convention of performing from memory is a well-established practice for particular instruments and musical genres, but an exception is often made for non-tonal music composed in recent centuries. No study to date has systematically investigated the reasons for such exception and musicians' views on this matter. Moreover, the existing principles of memorisation that are thought to apply to musicians in the highest levels of skill are strongly based on the use of conceptual knowledge of tonal musical vernacular. Such knowledge is often obscured or absent in non-tonal repertoire.

This thesis aims to extend the findings of previous research into musical memorisation in the context of non-tonal piano repertoire by documenting pianists' views and practices in committing this music to memory. An interview study with pianists expert in contemporary music (Chapter 3) establishes the background for the thesis. A variety of views on performing contemporary music from memory were reported, with several pianists advocating benefits from performing this repertoire by heart and others from using the score. Memorisation accounts revealed idiosyncrasy and variety, but emphasised the importance of specific strategies, such as the use of mental rehearsal, principles of chunking applicable to this repertoire and the importance of different types of memory and their combination.

The second study (Chapter 4) explores the topic in further depth, by thoroughly examining the author's entire process of learning and memorising a newly commissioned non-tonal piece for prepared piano. This study extends findings from performance cue (PC) theory. This widely recognised account of expert memory in music suggests that musicians develop retrieval schemes hierarchically organised around their understanding of musical structure, using different types of PCs. The use

of retrieval schemes in this context is confirmed by this study. The author organised the scheme around her own understanding of musical structure, which was gradually developed while working through the piece, since the music had no aural model available or ready-made structural framework to hold on to early in the process. Extending previous research, new types of PCs were documented and, for the first time, negative serial position effects were found for basic PCs (e.g., fingering, notes, patterns) in long-term recall. Finally, the study provided behavioural evidence for the use of chunking in non-tonal piano music.

The third study (Chapters 5 and 6) extends these findings to a serial piece memorised by six pianists. Following a multiple-case study approach, this study observed in great depth memorisation approaches carried out by two of those pianists, who performed the music very accurately from memory, and by one pianist who performed less accurately. The first two pianists developed retrieval schemes based on their understanding of musical structure and different types of PCs, mainly basic and structural. Comparisons between the pianists revealed very different views of musical structure in the piece. Even so, both musicians used such understanding to organise encoding and retrieval. The pianist with the least accurate performance adopted an unsystematic approach, mainly relying on incidental memorisation. The absence of a conceptual retrieval scheme resulted in an inability to fully recover from a major memory lapse in performance.

The findings of this research provide novel insights into pianists' views towards performing non-tonal music from memory and into the cognitive mechanisms governing the encoding and retrieval of this music, which have practical applications for musicians wishing to memorise non-tonal piano music.

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Vera Fonte

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

TABLES

FIGURES

1 MUSICAL MEMORISATION: A REVIEW

1.1 INTRODUCTION

Musical memorisation has long been a topic of interest for performers, pedagogues and researchers in the areas of cognitive science, music psychology and education (Ginsborg, 2017; Mishra, 2010a). Several articles and books on music performance and pedagogy have reflected upon the convention of performing from memory, its benefits and limitations (Aiello & Williamon, 2002; Ginsborg, 2004; Hallam, 1997; Hamilton, 2008; Mishra, 2014). Performers and pedagogues have also relied on their practice-based experience to recommend helpful strategies to memorise music reliably and effectively (Gordon, 2006; Hughes, 1915; Klickstein, 2009; Matthay, 1926; Shockley, 2001). Meanwhile, the topic has been a source of fascination among music psychologists, who have collected empirical evidence for decades on how musicians memorise, and have developed theoretical assumptions about the mechanisms governing the encoding and retrieval of musical information (e.g., Chaffin et al., 2002; Ginsborg, 2002; Hallam, 1997; Mishra, 2005; Rubin-Rabson, 1937; Williamon & Valentine, 2002). The growing body of research on this topic has found memorisation principles and approaches common to different instrumentalists and singers with varying levels of expertise. Several studies on expert memory have suggested that professional musicians rely on their knowledge of Western musical vocabulary and think in structural terms to organise encoding and retrieval (Chaffin et al., 2010; Chaffin & Imreh, 2002; Chaffin & Logan, 2006; Williamon & Valentine, 2002). Nevertheless, most evidence supporting these findings has been based on memorisation of tonal repertoire, which follows principles and structures well known by musicians trained in the Western classical tradition.

As emphasised by Apel (1972, p. 62), although tonality dominates about two centuries of music creation, since the end of the 19th century composers have progressively moved away from tonal concepts and started exploring very different principles of composition. Performers interested in repertoire written after this period need to adapt to these changes and interact with less familiar musical language and unconventional performance practices (Thomas, 1999). With the exception of a few

studies (Chueke & Chaffin, 2016; Ginsborg & Chaffin, 2011a, 2011b; Mishra & Fast, 2015; Soares, 2015; Thomas, 1999; Tsintzou & Theodorakis, 2008), there is still little suggestion in the literature on how musicians learn and memorise repertoire with less familiar musical information, unconventional performance practices and unfamiliar, obscure or non-existent structural forms.

Performance conventions have also changed, depending on repertoire. It is interesting to note that, for specific instruments and within particular musical genres, performing without a score is a well-established practice in different performance scenarios, such as examinations, competitions and recitals (Ginsborg, 2004; Williamon & Valentine, 2002). Nonetheless, an exception is often made for more recent styles of repertoire, because they are assumed to be more difficult to remember (Hamilton, 2008; Mishra, 2014). Even so, renowned soloists of contemporary piano repertoire [1] continue performing highly demanding compositions from memory. Moreover, some contemporary composers also commend this practice for specific pieces. For example, George Crumb considers that compositions using symbolic notation (e.g., circular, spiral or cross forms) should be performed without score. As mentioned in his preface to the well-known piano work *Makrokosmos,* "the symbolic notations […] must, obviously, be memorized when performed. In fact, the entire work becomes much more dramatic and musical if it is played from memory" (Crumb, 1972).

Although a new rule freeing musicians to perform new styles of repertoire from memory has recently appeared in competitions and recital settings (Hamilton, 2008; Mishra, 2014), there is still a lack of studies investigating pianists' views towards this matter and exploring how memorisation unfolds in this context. Personally, I have been performing non-tonal piano music for several years and I often feel the need to free myself from the score, if only for specific moments. Even though literature offers very helpful tools for practitioners to memorise tonal music, there is still a gap in practical guides to memorisation of non-tonal piano repertoire.

[1] Definitions of contemporary piano repertoire or contemporary music are often ambiguous or controversial. Some authors have associated this expression to music composed in the present. Nevertheless, others also consider works written after the Second World War to be "contemporary" because "they never really fit in, and become self-reflexive and critical in ways that relate not only to its time, but also to its own history" (Paddison & Deliège, 2010, p. 1). This thesis will adopt the broader definition, using the expression "contemporary piano" music for Western music written since 1945.

Given the current state of understanding, the central aim of this thesis is to reconsider and extend the findings of previous research on musical memorisation to non-tonal piano repertoire.[2] These findings hope to contribute to the development of new knowledge in the field of musical memorisation and to the documentation of strategies used by musicians to commit this music to memory.

The present thesis will start by reviewing the current state of literature seeking to understand musical memory. A contextualisation of the topic will be provided through an overview of key findings of research on human memory. Given that non-tonal piano repertoire is often highly demanding for pianists and performed by musicians with high levels of skill, models of expert memory will also be considered and reviewed. Finally, existing studies on music memorisation of tonal and non-tonal repertoire will be examined and discussed, concluding with a reflection on the limitations of the current body of research and a statement of the main research questions serving as framework for the present research.

The second chapter will review and discuss existing methodological approaches employed in the study of human memory, in particular musical memory, followed by an overview and rationale of the methods employed in the empirical studies of this thesis.

Chapters 3 to 6 will present the three studies conducted as part of this thesis. The first study examines accounts of expert pianists' experiences with contemporary piano repertoire. The subsequent chapters will then present large-scale longitudinal case studies, one by the author and the second with other pianists, in preparing non-tonal pieces for memorised performance. Finally, Chapter 7 summarises and discusses the main findings of these studies, provides practical applications for performers and pedagogues, and proposes new directions for future research.

1.2 BASIC PRINCIPLES OF HUMAN MEMORY

Research into human memory provides understanding of who we are and why we act in certain ways. The subject has sparked the curiosity of scholars in different fields,

[2] Since music written post-1945 can also include tonal rules of compositional, the term *non-tonal* is employed in this thesis to refer to music which moves away from tonality by using, for example, modal or atonal principles of composition.

including cognitive sciences, psychology, neuroscience, neuroanatomy and neurology (Radvansky, 2017).

Memory has been defined as "the faculty of the mind to bring back past experiences into consciousness" (Ebbinghaus, 1905, quoted by Taylor, 2013, p. XXXV). This sophisticated and multifaceted mechanism has been addressed from different perspectives. Some scholars have focused on locations where the information is stored (memory stores), or on the features of stored memories (memory trace or *engram*), while others have focused on the mental processes used to acquire, store or retrieve different types of information (Kahana, 2012).

Existing literature on memory storage commonly agrees on the existence of three memory structures: sensory memory (SM), short-term memory (STM) with a working memory (WM) component and long-term memory (LTM) (Radvansky, 2017). Current research on how memory is processed acknowledges the existence of three main stages: encoding, storage and retrieval (Baddeley, 1997). The structures and processes leading to the development of memories will be further discussed in subsequent sections.

1.2.1 Memory Structures

Before the late 1960s, memory was seen as a unitary faculty. However, different sources of evidence suggested the existence of separate structures. One of the most influential theoretical models on this subject is the *modal model* described by Atkinson and Shiffrin (1971). This model has often been used as a basis for discussions on how information is stored in memory over time.

Based on the hardware of the 1960s mainframe computer, this theory proposes that external stimuli flow through different hypothetical structures for varying periods of time. First, information moves from the environment to a set of sensory registers (SM). If attention is given to particular stimuli, they are transferred into a temporary store of limited capacity, which is also responsible for some control processes (STM). The longer the information stays in this store, the higher the probability of it being transferred into a more permanent store (LTM).

1.2.1.1 Sensory memory (SM)

SM relates to the perception of environmental stimuli that can help form our memories. Stimuli enter this system regardless of the attention given by the individual (Lutz & Huitt, 2003). This structure allows low-level processing, such as perception and integration of sensory stimuli. Modality-specific, SM is based on different sensory systems, such as vision, hearing or taste. Atkinson and Shiffrin (1971) proposed the existence of a SM based on the processing of visual (*iconic memory*) and auditory (*echoic memory*) information. Later, other sensory registers have been identified, such as *haptic memory* for touch information (Craik & Lockhart, 1972).

Iconic memory is the sensory register that has received the most attention. Sperling (1960) was one of the first to conduct experiments investigating its capacity and duration, suggesting that, despite the large capacity of this store, the decay of information is quite fast. This model and subsequent research (see Irwin & Gordon, 1998) suggest that individuals select information to be transferred from iconic memory based on the physical attributes of the stimuli (spatial location, size, shape or brightness).

Echoic memory comprises auditory material. The mental representations of echoic memory are usually defined as *echos*. Some authors suggest that echoic memory has larger capacity (Galotti, 2008) and lasts longer than iconic memory (Crowder, 1976).

Haptic memory relates to individuals' engagement with the environment through touch. Several factors need to be taken into account when studying this type of memory, namely pressure, temperature, or the sensitivity of different body parts (Watkins & Watkins, 1980). Several studies suggest that haptic memory capacity is large, but the information decays rapidly (Radvansky, 2017).

1.2.1.2 Short-term memory (STM)

STM is a structure that temporarily stores and works with information as part of different cognitive tasks such as learning, reasoning and comprehending (Atkinson & Shiffrin, 1971; Baddeley, 1997). Atkinson and Shiffrin (1971) claim that information

can be retained in this structure for around 30 seconds. Later, Baddeley et al. (2009) reduced it to just a couple of seconds.

Snyder (2000) considers that storage duration in STM depends on the complexity or novelty of the material and on how long the information can last without rehearsing. If individuals seek to maintain information for extended periods of time in this store they need to *rehearse* (i.e., to keep it active through mental repetition). Rehearsal allows temporary retention of information in this system and contributes to its transfer into a more permanent store.

Regarding capacity, researchers generally agree that STM can retain around seven units of information, plus or minus two. Miller (1956) argues that individuals who can retain information above these numbers are using other cognitive resources to extend the original capacity (see section 1.3.1, p. 28). Information appears to be replaced when full capacity in this storage is reached.

Although highly influential in human memory research, Atkinson and Shiffrin's (1971) concept of STM received heavy criticism. Their model mainly describes this structure in terms of storage capacity, rather than functionality (i.e., how this memory is used to manipulate information during cognitive tasks).

Baddeley and Hitch (1974) addressed this limitation by proposing that STM works as a general working memory with multiple components. Working memory is used to retain information, while other cognitive processes such as reading, learning and problem-solving are carried out in parallel. These authors proposed a three-component model of working memory, including a central executive controller that supervises two slave systems: the *visuospatial sketchpad*, for visual and spatial information, and the *phonological loop*, for speech-based information.

Working memory is nowadays accepted as an essential component of STM. However, some researchers have argued that the concept of working memory proposed in Baddeley and Hitch's (1974) model is limited, as it fails to properly explain musical memory (Berz, 1995).

Berz (1995) found different levels of correlation and interference when examining working memory in language and music. Based on these results, he proposes the addition of a third slave system to Baddeley and Hitch’s (1974) model, dedicated to the processing of music. This component would be very similar to the phonological loop, but with an additional musical store and a control process based

on a specific inner speech (musical inner speech), that could be related to Gordon's (1999) concept of audiation.[3]

1.2.1.3 Long-term memory (LTM)

When individuals talk about memory, they are usually referring to a more permanent system known as long-term memory. In this store, the information can reside in a dormant state until it is brought back to consciousness. If individuals were conscious of all the information stored in long-term memory, they would not have enough capacity for new information (Berz, 1995).

Among more long-lasting memories, a distinction has been made between *declarative* and *non-declarative* memories. The first refers to memories of events and facts that can be consciously remembered and described in words. The second relates to information that can be accessed implicitly, without consciousness, such as motor movements (Snyder, 2000).

Declarative memories can also be classified as *semantic* and *episodic*. When we speak about knowing, we usually refer to semantic memory (i.e., memory of facts, meanings and abstract concepts related to our knowledge of the external world). This type of information is usually organised into abstract categories. These are not stationary, being constantly elaborated and refined. Individuals can develop particular knowledge categories of objects and single events or more complex meta-categories of entire types of experiences and events, known as *schemas*. Episodic memories refer to particular events and life experiences, also known as *autobiographical memories*, since they always involve the presence of the "self" (Squire, 1992).

Most human experiences are related to the interaction between episodic and semantic memory. For example, semantic categories are based on episodic memory of particular events. On the other hand, those events are related to objects and meanings that can fit into semantic categories (Rubin, 2006).

So far, some of the descriptions above have focused on conscious memorisation. However, as mentioned above, some memories involve cognitive processes that are not available to our consciousness. Memories of muscular acts

[3] Gordon states that "audiation is to music what thought is to language […] language is the result of the need to communicate. Speech is the way we communicate. Thought is what we communicate. We also audiate when we hear and understand in our minds music that we may or may not have heard but are reading in notation or are composing or improvising" (Gordon, 1999, p. 42).

(kinaesthetic memories) are usually non-declarative. These types of memory are usually referred to as *implicit*. They are related to the knowledge of *how* to do things. Their development is often based on arduous repetitive practice and its retrieval occurs without conscious effort (Radvansky, 2017).

1.2.2 Memory Processes

Memory can also be portrayed at an operational level and thought of as an assembly of symbiotic processes (Radvansky, 2017). Researchers agree on the existence of three main processes involved in the formation of memories: encoding, storage and retrieval. First, information is encoded into a format that can be understood. Afterward, it can be stored either temporarily or permanently. Finally, if stored permanently, it can be retrieved whenever needed (McBride & Cutting, 2018).

1.2.2.1 Encoding

Encoding is the process of receiving and converting stimuli from the environment into a form that can be stored in memory (Shergill, 2012). This process can be active – if there is a deliberate attempt to retain information, or less active – if made without deliberate intention to retain the information. Nevertheless, attention to the stimuli being processed is often required (McBride & Cutting, 2018).

When an event is encoded, different aspects can be taken into account (e.g., object shape, smell, texture, function, colour and meaning, among others). Researchers have been trying to understand how these different dimensions of encoding interrelate and how they affect memories that will be later formed (Shergill, 2012).

One possible view is that our mind works as a hierarchically organised cognitive system. Thus, specific modalities organised in different hierarchical levels will contribute to the encoding of new information. Sensory modalities can be found in the lower levels of the hierarchy, while deeper modalities (e.g., meaning) can be found in the higher levels. First, the sensory modalities process different aspects of the stimuli. Later, they interact with each other and with deeper modalities to transform the information into a storable unit (Bower, 1967).

Snyder (2000) identifies and describes two encoding processes. First, different features from the stimuli are extracted from the various SM systems (*feature extraction*). Later, they are bound together to form perceptual categories (*perceptual categorisation*). For example, when musicians first sight-read a score, they extract aspects such as visual features of the score (notation), the way it sounds or the feeling of playing it. All this information is processed through different sensory modalities and can also be combined with deeper modalities such as musicians' previous knowledge of the musical style.

Different factors can contribute to a successful encoding. These can be internal (e.g., prior knowledge or motivation) or external (e.g., learned materials and experimental instructions). Additionally, the way information is processed may influence the quality of encoding (Shergill, 2012). For example, rehearsal is a process that can influence how long information will remain in memory. Two types of rehearsal may lead to successful encoding: *maintenance rehearsal* – in which the information is kept passively (e.g., through rote repetition) – and *elaborative rehearsal* – in which the individual relates the information in a meaningful way to other information previously or currently presented.

If successfully encoded, the information acquires the necessary requirements to be stored in memory.

1.2.2.2 Storage

Information can be stored in memory for short periods of time (as in SM and STM) or long and permanent periods (in LTM). In order to effectively and quickly respond to challenges of the external world, humans tend to store the information into categories. Such grouping process helps individuals to create a "concise form in which experience can be coded and retained" (Snyder, 2000, p. 81).

The process of categorisation can occur in different stages of the encoding process. Snyder (2000) identifies two types of categories encoded at different moments. *Perceptual* categories are developed in the initial stages of perception, when the sensory stimuli are first received from the environment. After different features of the environment have been extracted, they are combined to form unified elements. Later, these perceptual categories can be merged into *conceptual* categories. Conceptual categorisation can be deliberate, conscious, and helps

grouping memories of objects and events that may occur at different periods. Since conceptual categories are a combination of perceptual categories, these two types can interact in different ways. As a result, categorisation is a subjective process specific to each individual (McBride & Cutting, 2018).

Research in cognitive neuroscience has suggested that information is not held in a single place in the brain, but dispersed across different brain areas. Brain areas such as the hippocampus are associated with the storage and processing of long-term memories (Snyder, 2000).

1.2.2.3 Retrieval

The last process of memorisation is known as retrieval and involves the recovery of information stored in memory. Different types of retrieval have been identified: *recall* – active search for a specific item in memory (e.g., an historical fact); *recognition* – identification of an item or event when it corresponds to previously stored memory representations; and *re-learning* – retrieval of information that was learned more than once (Slotnick, 2017).

Several factors have been found to affect retrieval, namely the distinctiveness of the items or events, the actual task used to retrieve and the occurrence of effective retrieval cues (Terry, 2016).

Numerous studies have looked at the effects of serial position of items or events on recall. Existing evidence consistently shows that when individuals are asked to recall a list of items, recall is better for the first (*primacy effect*) and last *(recency effect)* items. Several theories have been developed to explain these effects. Some claim that the first items of a list are better recalled because they received more rehearsal than items at other locations, thus becoming more prone to be retained in LTM. Recency effects, in turn, can be related to the nature of the retrieval task. These effects are commonly found in tasks requiring short-term periods of retention. Some authors argue that the final items are better recalled because they still remain stored in STM at the time the retrieval task is performed. Other theoretical accounts suggest that the first and last items are often available because those stimuli are more distinctive within the experimental context or because these two locations are not subject to so much interference as other items (Terry, 2016).

Serial position effects have been well documented in literature on verbal memory, but evidence has also been provided for musical memory. Recent studies suggest that musical recall is also influenced by serial position. Evidence of primacy and recency effects has been found for recall of controlled short pitch sequences (Greene & Samuel, 1986; Roberts, 1986; Williamson et al., 2006) and complete pieces of music (Chaffin et al., 2002; Ginsborg & Chaffin, 2007; Lisboa et al., 2009; Maylor, 2002; Mishra, 2010).

However, research on the recall of complete musical pieces has suggested that serial position fails to explain all patterns of results found. Mishra (2010b) argues that although music compositions are sets of pitches that should be recalled in a specific order, other organisational aspects should also be taken into consideration. The numerous pitches comprising a piece of music are organised into different rhythmic, melodic and harmonic groups. For certain instrumental pieces, those groups are spread across different layers (e.g., one for the right hand and another for the left). Additionally, all these elements are part of high-level hierarchies where these elements are combined into bars, phrases and larger sections.

Existing evidence suggests that higher-order retrieval structures are used to guide recall of serial information (Chaffin et al., 2002; Ginsborg & Chaffin, 2007; Lisboa et al., 2009; Maylor, 2002; Mishra, 2010b). Primacy effects have been found not only at the beginning of pieces, but also at structural boundaries and at particular musical features to which attention was paid during practice and which are used as landmarks during memorised performance (Chaffin et al., 2002; Ginsborg & Chaffin, 2007b; Lisboa et al., 2009; Maylor, 2002; Mishra, 2010b).

1.2.2.4 Interaction Between Encoding and Retrieval

A topic frequently addressed in memory research is the interaction between processes of encoding and retrieval (Chaffin et al., 2002, 2010; Ginsborg & Chaffin, 2007). Studies in this area have suggested that similar contexts of encoding and retrieval lead to more effective memorisation. This is known as the *encoding specificity principle* and applies not only to recall but also to recognition processes (Tulving & Thomson, 1973). Some studies have suggested that contexts of encoding and retrieval are not required to be exactly the same, but similar (Smith & Vela, 2001). Moreover, just thinking about the context of encoding can also aid recall (Smith et al., 2014).

Contexts of encoding may be related to aspects such as the surrounding environment, internal state (mood), physiological state or thoughts about the information and the type of processing (Smith, 1979). The relationship between contexts of encoding and retrieval can be of particular importance for musicians. As an example, when preparing musical works for memorised performance, musicians practice in a room on their own. However, they often retrieve those musical works in a completely different context (e.g., a concert hall), with the added pressure of an external audience. Pianists, for example, do not often perform on the same instrument used to practice.

Research on interactions between encoding and retrieval has also suggested that quality of retrieval is better if the physiological state is the same during learning and subsequent recall. This phenomenon is known as *state-dependent memory* (Blaney, 1986; Bower, 1981). Studies in this area have used background music as part of the surrounding environment to affect mood states, but there is still a lack of research looking into the relationship between the physiological state of musicians during practice and performance, and its consequences on retrieval quality.

The thoughts and types of processing used during encoding and retrieval also have an important role. Retrieval appears to be more effective when the mental processes used are associated to those applied during learning. This principle is known as *transfer appropriate processing* (Blaney, 1986; Bower, 1981). As an example, emphasising meaning during encoding (*deep processing*), or thinking about the material in varied ways (*elaboration*) positively impacts recall and recognition (Franks et al., 2000).

1.3 MEMORY AND EXPERTISE

The study of expertise has provided understanding of how individuals with different levels of skill learn and acquire knowledge.

Particularly in the field of memory, researchers have been interested not only in experts' ability to store a vast amount of knowledge in their domain, but predominantly in their capacity to store new information rapidly for later retrieval (Ericsson & Smith, 1991). Several studies have attempted to provide understanding on the role of knowledge in categorization and expertise, to investigate the memory

limits that experts can transcend and those that they must abide by, and to collect the strategies that help experts achieve results superior to those of novices in memory tasks (Richman et al., 1996).

This review will focus on the main theoretical accounts that have been developed in recent decades to explain the evidence found in empirical studies of expert memory, focusing later on how the existing theories of exceptional skill and behaviour apply to the musical domain.

1.3.1 Chunking Theory

The *chunking theory* by Chase and Simon (1973a, 1973b) is one of the most influential accounts of expert memory (Gobet, 2015).

Essentially, chunking theory argues that expertise in a specific domain is developed through the acquisition of a large number of *chunks* (storage units of meaningful information). The experts' ability to quickly recognise and categorise new information is related to how they access those chunks. First, the use of a discrimination network helps them evaluate the features of the perceptual stimuli while accessing existing chunks. Such a process allows them to extract the distinctive elements of the incoming information. Additionally, the chunks are also linked to new information and inform the individual about the type of action that should be adopted in the presence of a specific condition.

Chunking theory retains the assumption that STM is limited to about seven units of information (Miller, 1956). Nonetheless, experts are able to encode more information in each unit than novices because instead of storing single elements in STM, they store chunks that have been developed in LTM. The account assumes that players of all skill levels learn at a similar rate (Simon, 1969). However, experts can achieve superior results because they have acquired, through extended practice, more and larger chunks.

Strengths of chunking theory include its ability to explain, in a single theoretical framework, different aspects of experts' perception, memory and problem-solving. Moreover, it is able to stipulate limits of the human information processing system, including the short capacity of STM (7 ± 2 chunks) and the time to learn a

new chunk (≈8 s). Finally, it explains why experts can recall larger amounts of information than non-experts (Gobet, 2015).

Nevertheless, several criticisms have been made of the theory. Gobet (1998) argues that, despite providing a good overall explanation for the empirical data, the theory overestimates the role of STM and underestimates the speed at which experts can store new information in LTM. Moreover, he argues that the representation of information by experts is done at a higher level of abstraction than that of perceptual chunks. Some empirical findings show that interpolating a task between the presentation of material and its recall does not affect experts' retention (Charness, 1976). Therefore, researchers started to raise doubts about STM being the only store in which experts were holding the information and started wondering about the role of LTM in this process. Subsequent theories attempted to improve these weaknesses.

1.3.2 Skilled Memory Theory

One reaction to chunking theory was a theoretical account designed to explain findings from research on the digit-span task. Studies in this area found that subjects who were not at the highest levels of expertise were able to outstandingly expand their memory capacity after extended training (Charness, 1976). *Skilled memory theory* (Chase & Ericsson, 1982; Ericsson & Staszewski, 1989) argues that experts' extraordinary memory abilities are based on their use of *retrieval structures* – "pre-learnt domain-specific LTM structures enabling rapid storage in LTM" (Gobet, 2015, p. 49).

The development of a retrieval structure requires quick storage of information in LTM. This is achieved through the combination of the incoming information with a large body of domain-specific knowledge. The association is made through the use of retrieval cues, which are organised into a stable structure (Ericsson & Staszewski, 1989). The time required to store and retrieve LTM information is decreased through extended practice (Chase & Ericsson, 1982; Ericsson & Staszewski, 1989).

The concept of retrieval structure has been used not only to explain experts' memory abilities, but also to account for expert performance. The main problems addressed with this theory are related to the relationship between working memory and LTM (Ericsson & Staszewski, 1989).

1.3.3 Long-Term Working Memory Theory

In response to some criticisms, Ericsson and Kintsch (1995) developed an extension of skilled memory theory, known as *long-term working memory* (LT-WM) theory.

Ericsson and Kintsch (1995) argue that the working memory mechanism should be extended and embrace the role of LTM in the process of storage during complex tasks. According to the authors, skilled activities require much greater storage capacity than the one available in STM. Therefore, they propose a Long Term-Working Memory mechanism (LT-WM), suggesting that a significant part of the accessible information is stored in LTM and can be accessed through the use of retrieval cues in STM. Nevertheless, they reinforce the idea that LT-WM can only supplement short-term working memory in cognitive activities of a specific domain and cannot be generalised to other fields.

In agreement with skilled memory theory, this account proposes that during complex cognitive activities the information is encoded and retrieved through cognitive structures: retrieval structures (a set of retrieval cues associated to encoded information and organised hierarchically), or more elaborated structures (schemas and patterns). However, these mechanisms and the way they are structured are not clearly specified (Gobet, 1998). Another criticism is related to the recall of random material. LT-WM theory suggests that experts are able to easily memorise material fitted within their domain of expertise. However, this assumption may be questioned in the case of randomised material. Gobet (2015) argues that, in some domains (e.g., chess) "detailed memory structures can only be used if the players have acquired the relevant structures for this specific subset of chess positions" (Gobet, 2015, p. 51).

1.3.4 Template Theory

Template theory (Gobet & Simon, 1996) represents another attempt to respond to some weaknesses of chunking theory, namely the overemphasis on the role of STM and the underestimation of LTM storage speed (Gobet, 2015). This account is based on simulations provided by CHREST (chunk hierarchy & retrieval structures), a computer model developed to simulate chess players' perception and memory (Gobet

et al., 2001). In the domain of chess, CHREST was used for simulated aspects, such as the percentage of pieces correctly recalled as a function of expertise level, the way players group pieces while reconstructing positions and the type of errors made (Gobet & Waters, 2003), and characteristics of chunks and templates acquired by novices trained to memorise chess positions (Gobet & Jackson, 2002). Later, CHREST was also used to simulate the development of expertise in other domains, such as the game *Go* (Bossomaier et al., 2012), the African game of *Awele* (Gobet, 2009) and memory for computer programs (Gobet & Oliver, 2002).

Template theory is based on these findings, and its predictions have been compared in detail with empirical data from different domains of expertise (see Gobet, 2015 for a review). The theory asserts the following principles: (1) experts rely on a large number of chunks, arranged through a discrimination net, which can be accessed through varied routes; (2) they hold a vast amount of LTM knowledge, organised into productions and schemata; (3) they are able to link perceptual chunks with the LTM knowledge. The elaboration of learning mechanisms such as chunks, production and schemas, as well as the development of links to connect them, explains the many years required for the acquisition of expertise (Gobet, 2015).

The key idea of template theory is that some chunks frequently used in a given domain can generate more complex data structures, defined as *templates* (Gobet & Simon, 1996). Templates are very similar to schemata, but in this case, contrary to Ericsson and Kintsch's (1995) theory, their characteristics and organisation are clearly defined (Gobet & Simon, 1996).

Templates contain two main components: the *core*, where stable information is maintained (similar to a chunk) and the *slots*, which contain variable information. For example, in the template of a *piano room*, the fact that the room has walls, floor and a piano is incorporated in the *core* of the template. However, information that can vary in different rooms (e.g., type of piano, size, bench) will be encoded by the *slots* of the template.

One important difference between this and other theoretical accounts, such as skilled memory theory (Chase & Ericsson, 1982), is related to the premise that all types of information, as long as they fit within a specific domain, can be encoded through retrieval structures. Template theory argues that this is not the case for all kinds of material. The templates used in CHREST can only be used by experts when "the conditions imposed by the template's core are met" (Gobet, 2015, p. 54).

Consequently, some material, even if belonging to the domain of expertise, is not possible to associate to any template. This would be the case for randomised material for some domains such as chess. We may also suggest that, in the musical domain, this might be the case for non-tonal music, in which the well-known patterns and structures learned and extensively practised by professional musicians are altered or simply not present. Consequently, reported difficulties related with the memorisation of this type of music can perhaps be related to the inability to associate the information with the *core* of existing templates.

Nevertheless, there is a gap in this area of research, and more empirical evidence needs to be collected in order to develop such assumptions. Moreover, the computer model CHREST still predicted that chess masters should be able to recall random chess position better than novices, but only in terms of small structures (Gobet, 2015).

A review of existing studies examining experts' and novices' ability to memorise randomised material in different areas of expertise will be provided in the next section.

1.3.5 Do Experts Lose Their Power with Randomised Material?

A myth commonly found in literature on expert memory is that experts lose their power with randomised stimuli (Gobet, 2015, p. 37). However, current research has suggested that this idea can be too simplistic to explain real circumstances. Recent studies have found that experts in different domains still maintain some consistent memory advantage in relation to novices even if stimuli are randomised and high-level structures removed. However, this advantage is in general significantly smaller when compared with more structured material (Sala & Gobet, 2017).

Gobet and Simon (1996) found that experts still maintain some memory advantage in relation to novices even with chess positions without any high-level structure. A similar premise was proposed in the dance domain by Starkes et al., (1990).

Sala and Gobet (2017) carried out a meta-analysis of studies, categorised into five domains (games, music, programming, sports and others) to further investigate this issue. An overall correlation between skill level and ability to recall random

stimuli, as well as a moderator analysis to investigate the relationship between these two variables, were calculated. Results from this meta-analysis suggest that even though the overall correlation was moderate, it was statistically significant. Curiously, the only domain demonstrating effects higher than moderate was music (r = .69). According to Sala and Gobet (2017) this is due to an empirical anomaly that can be explained by a limitation on the degree of randomness used in the studies selected for the meta-analysis. These studies used small number of notes (e.g., Sloboda's study used five-note stimuli), reducing the number of possible combinations significantly.

Based on these findings, Sala and Gobet (2017) suggest that experts still have an advantage in relation to novices when memorising random material, because they have a superior ability to recognise small chunks occurring by chance in random material. However, this ability is highly reduced when compared to non-randomised material.

1.3.6 Summary – Principles of Expert Memory

In summary, several principles from the theories described above have been used to explain expert memory. There are three main principles emerging from these theories that have been often related to the musical domain:

(1) *Chunking* – experts use knowledge acquired through years of training to chunk new information into meaningful units (Ericsson et al., 1993; Ericsson & Charness, 1994).

(2) Organisation – experts organise these chunks into more complex structures (e.g., retrieval structures or templates). These structures are hierarchically organised and afford cues that can be associated with the new information to be encoded. Theoretical accounts, such as template theory, suggest that the use of these structures is not as straightforward for randomised material, as it is not directly related to the knowledge stored in LTM (Gobet, 2015).

(3) Prolonged Practice – experts engage in extended practice of what will become their retrieval structure. This increases the speed with which the retrieval structure is used to access information in LTM (Ericsson & Kintsch, 1995).

Evidence suggesting that these principles govern expert memory was first provided in domains such as chess, in which memory is mainly conceptual. However, particularly since the 1990s, researchers have investigated the application of these assumptions to the musical domain (e.g., Chaffin & Imreh, 2002; Williamon & Valentine, 2002). Studies investigating if these principles apply to skilled music performance will be now further discussed.

1.3.7 The Study of Expert Memory in Music

1.3.7.1 Evidence of Chunking in Music

As discussed above, chunking theory claims that STM capacity is increased by chunking the information into meaningful units. Skilled performers use knowledge acquired through years of training to encode information into meaningful chunks, instead of single units (Chase & Simon, 1973b, 1973a). Previous studies have suggested that more experienced musicians use their domain-specific knowledge to facilitate melody storage and retrieval (e.g., Chaffin et al., 2002; Hallam, 1997).

Oura and Hatano (1988, p. 92) proposed a categorisation system for domain-specific knowledge in music. The authors suggest a classification into three main groups: (1) *melodic prototypes* – sequences of pitches stored in memory, often based on tonal melodies; (2) *ordering rules* – "pieces of knowledge concerning the form and construction of music, which can serve as a storage format and as a retrieval format"; and (3) *melodic memory strategies* – knowledge of how to use melodic prototypes, ordering rules and other recall strategies. The authors argue that the use of different memory strategies depends on familiarity with the melodies. Recall of familiar melodies can be more easily related to melodic prototypes and ordering rules, while unfamiliar melodies may require other types of strategies.

The idea that domain-specific knowledge will not be as easily applicable to less familiar or less structured melodies has also been addressed by other studies. Deutsch (1980) was one of the first to investigate the impact of hierarchical structures on subsequent recall of melodies. Graduate students with at least eight years of musical training were asked to write down aurally presented structured and unstructured

melodies. The structured melodies were composed of familiar tonal patterns of three notes (e.g., major triad), while unstructured sequences lacked clear principles of organisation. Results revealed significantly better recall for structured sequences. Deutsch (1980) suggested that unstructured sequences were not so easily encoded into meaningful chunks, thus demanding a more massive memory load.

Subsequent research has also extended these results to visually presented musical material. Halpern and Bower (1982) asked three groups of subjects with different levels of expertise to recall short melodies. The groups were divided according to experience with reading music and previous contact with music notation. Melodies were categorised as good, bad or random. Good melodies were adaptations of musical examples considered to have good musical structure. Bad melodies were developed by changing the order of the intervals from the good melodies, resulting in dissonant intervals or unexpected keys (i.e., omitting sharps or flats that would be expected in a particular key). Random melodies were generated by arbitrary selection of notes, resulting in even less familiar interval relationships than the other two types of melodies (Halpern & Bower, 1982, p. 34). After the visual presentation of the stimuli and a 15-second interval, subjects were asked to write down the melody on a musical staff. Musicians had better results than non-musicians with good melodies, but this advantage progressively decreased from good, to bad, to random. The authors suggested that musicians were able to chunk the musical information into meaningful units, but that this ability decreased as randomisation of the material increased.

The studies reviewed above have solely focused on STM of small musical excerpts. Chaffin et al. (2002, p. 203) have later found evidence that professional musicians use chunking in the first stages of encoding of entire musical compositions learned over long periods of time.

Although existing research has provided important insights into the use of chunking in music, there is still lack of behavioural evidence on the use of such strategy during encoding of entire musical compositions. Moreover, more research is needed to examine the use of chunking in complete non-tonal pieces. Finally, one specific group of experts has been neglected in research in this area. Several musicians are now dedicating their careers to the performance of more recent styles of repertoire, with language and structural forms very distant from the more familiar tonality. More research is needed to investigate if familiarity with this type of

repertoire will result in greater knowledge of its language and structures and, subsequently, in better results in these recall tasks.

1.3.7.2 Evidence of Retrieval Structures in Music

The study of retrieval structures in music has developed particularly since the late 1990s, with the pioneer work of researchers such as Chaffin and Imreh (1997, 2002) and Williamon (1999a). Their studies were the first to investigate in-depth the application of principles of skilled memory theory to music performance and to explore the characteristics of retrieval structures used by professional musicians.

Subsequent research has later extended these results to different instrumentalists with different levels of expertise across a wide range of repertoire (Chaffin, 2007; Chaffin et al., 2010, 2013; Chen, 2015; Chueke & Chaffin, 2016; Ginsborg & Chaffin, 2011a,b; Soares, 2015; Williamon & Valentine, 2002). Chaffin, Logan and Begosh (2009) claim that a piece of music can be retrieved by means of two main routes. Musicians can use a type of retrieval system developed almost spontaneously while learning the piece (*serial cueing*).[4] This system is composed of serial associations based on schemas stored in LTM for "rhythm, meter, harmony, or melody," which "directly link one passage with the next" (Chaffin, Logan, et al., 2009, p. 359). One advantage of this system is that it develops almost automatically and effortlessly. However, since each passage cues the memory for the next one, the musician can only perform from the beginning to the end, not being able to start at different places if memory is disrupted.

For this reason, it has been found that professional musicians develop a second type of retrieval system, based on conceptual memory (knowledge of the structure and features of the music). This retrieval structure is hierarchically organised and provides *content-addressable* access to specific locations in the piece, allowing the musician to start from different points in the music when needed (Chaffin, Logan, et

[4] Chaffin, Logan & Begosh (2009) and subsequent papers by Chaffin and colleagues have used the term *associative chaining* to characterise this type of retrieval scheme. However, in this thesis the term *serial cueing* is used to avoid confusion with the limited and mechanical process proposed by Ebbinghaus (1985), which is generally thought to have been repeatedly tested and discredited, even though this is not actually the case (Lindsey & Logan, 2019).

al., 2009). This system is used as a safety net in case the serial associations are disrupted during memorised performance.

Studies investigating how this conceptual scheme is organised and how its retrieval cues vary across musicians and different styles of repertoire will be now further discussed.

1.3.7.3 Hierarchical Organisation of Retrieval Structures in Music

Several studies investigating retrieval structures used by professional musicians have explored the musical elements founding their organisational basis. Existing evidence suggests that the formal structure of the music provides a ready-made framework for such organisation. Chaffin & Imreh (1994/1997/2002) were the first to examine how this principle applies to professional musicians. Their study constitutes one of the first thorough investigations of the entire process of memorisation of a particular piece of music. The authors used a longitudinal case study approach to examine how a pianist (Imreh) learned and memorised the third movement (Presto) from J. S. Bach's *Italian Concerto*. In total, 33 hours of practice were video recorded and 58 sessions were analysed and aggregated into three learning periods. The pianist was also asked to think aloud during practice and to comment to the camera on her thoughts and goals. Different sources of evidence (self-reports and behavioural data) strongly suggested that the pianist used a retrieval structure with specific cues organised in a hierarchical manner, with the formal rondo structure at the top level of the hierarchy. The pianist was familiar with this structural form prior to learning this piece, as the rondo is a basic framework often used by composers in tonal compositions from the baroque and classical periods (Chaffin & Imreh, 2002; Walton, 1974).

Subsequent research has examined to what extent these results apply to other musicians and other types of repertoire. Examples of related longitudinal case studies can be found with the same pianist memorising Debussy (Chaffin, 2007), a cellist memorising Bach (Chaffin et al., 2010), a jazz pianist (Noice et al., 2008), or a Grade 7 piano student memorising Schumann (Lisboa et al., 2015). All these studies have strongly suggested that the formal structure can be used as a basis of practice organisation as support to memorisation. Structural boundaries are strongly related to

starts, stops and repetitions during practice and have significant effects on subsequent recall.

A comparative observational study by Williamon and Valentine (2002) looked at the role of structure in the encoding and retrieval of J. S. Bach's works as a function of expertise. Twenty-two pianists of different levels of expertise were asked to memorise assigned works by J. S. Bach. The study was based on systematic observation of the pianist's practice sessions, through analysis of recordings on cassette tape. Based on the musician's self-reports, the authors categorised the bars of the piece into structural, difficult and other. In this case, structural bars were not necessarily connected to the theoretical formal structure of the piece. As in the studies discussed above, significant effects were found for structural bars. Across the learning periods, the frequency of starts and stops for all pianists (regardless their level of skill) tended to increase for structural bars and decrease for difficult bars. Musicians with the highest levels of skill started more on structural bars than novices.

Even studies based on memorisation of pieces with less obvious structures have suggested that musicians tend to search for the formal structure of the piece and use it as an organisational framework for their retrieval structures. A pianist memorising Chopin's *Barcarolle* reported using methods such as Schenkerian analysis to help clarifying the idea of structure and based her practice on these structural features, particularly in the first learning periods (Chaffin et al., 2013).

Recent studies have expanded these findings to non-tonal music. Studies examining a singer learning and memorising pieces by Stravinsky and Schoenberg have also established the fundamental role of structure in the singer's retrieval scheme (Ginsborg & Chaffin, 2007, 2011a, 2011b). Soares (2015) later extended these results to a non-tonal polyphonic piece for piano. By following the longitudinal case study method, he studied his own practice and memorisation of Messiaen's cadenza from *Oiseaux Exotiques*. The results largely resembled previous studies. The pianist divided the piece into meaningful sections and used this segmentation to organise practice.

An interesting aspect of Soares's (2015) study was the pianist's lack of awareness of the formal structure from the start. Later in the learning process, he realised that the structure resembled a traditional rondo, but he was not aware of this similarity when first approaching the piece. According to Soares (2015), his practice was "initially organised by the intuitive sense of the structural division, guided by

changes in texture and register, and the more obvious structural points identified by changes in birdsong motif and tempo" (Soares, 2015, p. 50). Curiously, a later comparison of the initial segmentation with the rondo structure revealed large similarities. This suggests that, even intuitively, the pianist relied on his domain-specific knowledge to discover an apparently less familiar structure.

Since Soares (2015) did not perform a recall test on his memory of the Messiaen later on, the effects of structure on LTM could not be analysed in this case. However, these effects were examined by the same author for a piece by Boulez (*Douze notations*). Played recall tests, spread across a seven-year learning period, revealed serial position effects for structural boundaries, thus suggesting they acted as landmarks in the musician's memory of the piece. An interesting difference between Soares's (2015) approach to Boulez and Messiaen is related to the nature of the structural segments. In Boulez's case, the segmentation of the piece differed from the actual compositional structure. Other performative aspects were taken into account when dividing the Boulez into meaningful sections, namely "beaming of rhythmic units, registral changes, and the movement of the hands" (Soares, 2015, p. 209).

Pianist Zélia Chueke also reported using subjective interpretation of musical structure to organise her memorisation of the opening bars of Schoenberg's Op. 11 No.3, a musical composition not following traditional formal structures and without any apparent story or plan (Chueke & Chaffin, 2016).

Performers' reliance on idiosyncratic interpretation of musical structure has been largely discussed among music theorists and musicologists. Cook (2013) and Rink (2015) have acknowledged the role of the performer's creative input in structuring a given piece. As argued by Rink (2015), "1. Musical materials do not in themselves constitute structure[s]: they *afford* the inference of structural relationships. 2. Inference of this kind will be individually and uniquely carried out whenever it is attempted, even if shared criteria result in commonalities between discrete structural representations" (Rink, 2015, p. 129).

Findings from existing studies suggest that, regardless of the type of structure assigned to each musical piece, its organisation in structural terms seems to be fundamental to memorisation (Chaffin et al., 2010; Chaffin & Imreh, 2002; Ginsborg, 2017; Soares, 2015; Williamon & Valentine, 2002). Nevertheless, caution should be taken when interpreting results from longitudinal case studies based on non-tonal piano music. Soares's (2015) study on Messiaen was based on a short excerpt

inspired on a conventional formal structure (rondo form) and did not collect evidence from long-term recall. His study on Boulez focused on recall, but did not examine behavioural evidence from the learning process. Chueke and Chaffin (2016) only focused on the opening four bars of Schoenberg's piece and their analyses focused solely on qualitative data. More research is needed to investigate the role of structure in the hierarchical organisation of retrieval schemes for complete non-tonal compositions.

So far, we have discussed the role of music structure in the hierarchical organisation of retrieval schemes developed by musicians. This review will now discuss in more detail the retrieval cues that constitute such structure.

1.3.7.4 Performance Cues

Several longitudinal case studies tracking memory development have identified different types of retrieval cues used as landmarks in memorised performance. These landmarks, commonly referred to as *performance cues* (PCs), are based not only on structural aspects of the piece, but also on technical, interpretative and expressive features (Chaffin et al., 2009b).

PCs are developed by attending to specific features of the music throughout the learning process until it comes to mind effortlessly. During practice, musicians focus their attention on particular musical features to make different types of decisions. Attention to such features tends to disappear as decisions become automatically incorporated while practising. However, some appear to remain focus of attention and act as retrieval cues during memorised performance (Chaffin & Logan, 2006). Actually, some PCs were found to remain in LTM for years (Ginsborg & Chaffin, 2011a).

Previous longitudinal case studies have identified different types of PCs: (1) *structural cues* – based on the important places in the formal structure mentioned above (e.g., beginnings of sections, subsections, phrases); (2) *expressive cues* – related to the musical feelings that the performer wants to convey to the audience and to musical turning points in the piece where those expressive components change; (3) *interpretative cues* – related to particular interpretative aspects (e.g., changes of tempo, dynamics); and (4) *basic cues* – related to basic aspects of execution of the piece (e.g., critical details of technique such as fingering or bowing). When working

in ensembles, musicians may also need to develop PCs in accordance with the other musicians. These types of PCs have been defined as *shared PCs* (Ginsborg et al., 2006).

The use of PCs during performance implies reliance on explicit memory (thinking explicitly about specific features of the piece), while also using implicit memory related to the procedural knowledge that is being used to perform. The use of explicit memory (provided by PCs) during performance of complex procedural tasks raises important issues. According to *explicit monitoring* theories, mainly based on domains such as sports, the reliance on explicit knowledge during performance under pressure of complex procedural tasks may cause a phenomenon known as *choking*.[5] These theories claim that one of the reasons performers choke under pressure is the increase of "self-consciousness and anxiety about performing correctly" and of a "step-by-step control" of the motor actions performed (Beilock & Carr, 2001, p. 701). If relying mainly on implicit knowledge, athletes will perform the actions almost automatically, thus tending to perform better than the ones self-controlling those actions (Otten, 2009). However, Beilock and Carr (2001) suggested that when this self-consciousness is trained, the phenomenon of choking not only tends to disappear, but performance also improves (Beilock & Carr, 2001, p. 722).

The value of training in self-conscious motor movements has important applications for musical performance. If PCs are intended to monitor and control complex motor actions, they should be thoroughly practised, to avoid disruption of more automatic movements (Chaffin et al., 2010; Chaffin & Logan, 2006). Indeed, studies investigating the development of PCs by professional musicians provided evidence that those landmarks are prepared during practice (Ginsborg et al., 2012).

Several studies have examined different aspects of PC development and contributed to the development of *performance cue theory (PC theory)* (Ginsborg et al., 2012). So far, this account has focused on how PCs are prepared during practice (Chaffin et al., 2010b; Chaffin & Imreh, 1997; Ginsborg et al., 2012), how they vary across different performances (Chen, 2015; Ginsborg, 2014; Ginsborg et al., 2012; Lisboa et al., 2013), how they differ between musicians of different levels of expertise (Chaffin et al., 2009a, b), different styles of repertoire (Chen, 2015; Soares, 2015), or different difficulty levels (Chaffin et al., 2009b), and how they relate to

[5] Performing more poorly than expected under pressure (Beilock & Carr, 2001).

other types of thoughts during performance (Ginsborg et al., 2012).

The development of PCs and their order of appearance throughout the learning process seems to depend on individual differences, experience, instrument, musical style or task demands (Chaffin, et al., 2009a; Chaffin & Logan, 2006). However, a general trend suggests that structural cues are attended to throughout the learning process, with attention changing between basic, interpretative and expressive PCs throughout (Chaffin et al., 2010; Chaffin & Imreh, 2002; Ginsborg & Chaffin, 2011a; Soares, 2015). More experienced musicians seem to use larger numbers of PCs than novices. Moreover, they appear to use more basic PCs, perhaps by having "higher standards of technical competence for themselves" (Chaffin et al., 2009a, p. 110). College students who have provided PC reports have relied more on interpretative PCs, while grade students more on structural PCs.

Studies examining the development of PCs for the same piece across different performances have suggested that their use can be flexible and adapted to the needs of the performance. Ginsborg et al. (2012, p. 225) found that musicians do not necessarily think about the same PCs in different performances. Some remain stable over time, while others "come and go". Variation of PCs across different performances was also observed in a study with a piano/cello duo (Lisboa et al., 2013) and a study examining different memorised performances of a piano piece by Ravel (Chen, 2015). Results from this last study revealed that basic cues tended to decrease across performances, giving place to a larger number of interpretative and expressive cues. Moreover, the pianist in this study reported the occurrence of a shift of attention between certain types of performance cues, with tendency to transform basic PCs into expressive PCs. Chen (2015, p. 221) suggested that her initial attention to basic issues "was internalised through extensive practice, and transformed into expressive impacts" on her own playing.

The development of PCs by the same musician for different pieces was also addressed by Ginsborg & Chaffin (2011b). This study examined the same singer's memorisation of two Schoenberg songs (Op. 14) and *Ricercar 1* from Stravinsky's *Cantata.* One of the aims was to assess the consistency of features attended during practice and PCs used by the same musician for different pieces. Although features attended during practice differed across pieces, proportions of different types of PCs were similar. This suggests that the same musician is likely to apply similar strategies

to monitor and guide her performances, even when dealing with works by different composers.

Chen (2015) attempted to fill this gap in the literature by exploring her development of performance cues across a wider range of repertoire. By performing several self-case studies following part of the protocol developed in previous longitudinal case studies (PC reports), she explored her development of PCs in repertoire belonging to different stylistic periods, from the classical period to music composed in the 20th century. Analysis of percentages of different types of PCs suggested that the use of these landmarks was directly connected with the content of the score. Similar types of PCs were used for stylistically different pieces, but with similar musical characteristics. For example, regardless of the musical style, Chen (2015) used fewer PCs for highly technical pieces and tended to use more basic PCs. On the other hand, she felt the need to adapt some PCs to the composer's style of writing. This was the case of pieces from the Impressionist period.

New types of cues were also used by Soares (2015) as an aid to memorisation of more complex non-tonal music. The pianist reported relying on cues based, for example, on recurrent intervals or on hand shapes. However, the identification of these new types of cues, both by Chen (2015) and Soares (2015), was solely based on qualitative analysis of self-reports. A comparison of these self-reports with behavioural evidence and with long-term recall tests would illuminate the role of these cues to organise practice and to work as landmarks in memorised performance.

Finally, several studies have examined the extent to which PCs function as retrieval cues, by analysing their effects on long-term recall. Evidence has been collected mainly in free written recall tasks. Results have revealed serial position effects for PCs, thus suggesting that they function as landmarks in the musicians' memory of the piece. Effects for structural PCs are consistent for all musicians. Their memory tends to be better at starts of sections than for the middle locations (Begosh et al., 2010; Chaffin & Imreh, 1997; Ginsborg & Chaffin, 2011). Moreover, expressive PCs have also been associated with better recall for different musicians (Chaffin et al., 2002; Chaffin et al., 2010), not only for written but also played or cued recall tasks (Begosh et al., 2010; Lisboa et al., 2009),

The most complete study to date examining long-term recall was conducted with a singer, who wrote out a piece by heart six times over a period of five years after the final performance (Ginsborg & Chaffin, 2011). Serial position effects found

for structural boundaries and cues for stress on words suggested that they became landmarks. On the other hand, the opposite effect was found for basic cues, suggesting that they became *lacunae.*[6]

In summary, PC theory has provided consistent evidence that highly skilled musicians memorise in similar ways, by using a mental map in working memory during performance, with different types of PCs organised around musicians' understanding of musical structure. Although development of PCs has been extensively researched with different musicians and different styles of repertoire, several aspects still need to be explored in further depth. For example, more research is needed to examine the development of PCs across different musicians for the same piece. Moreover, as stated above, the use of PCs in complete non-tonal compositions challenging traditional formal structures and performative practices still requires further examination.

1.4 MEMORISATION STRATEGIES IN MUSIC

1.4.1 General Approaches

The retrieval systems discussed above can be developed through different types of memorisation strategies.

Some musicians claim to memorise almost automatically (*incidental memorisation*), while others report to deliberately think about memorisation from the start or at some point in the learning process (*deliberate memorisation*) (Aiello, 1999; Chaffin & Imreh, 1997; Hallam, 1997). A study based on interviews with musicians of different levels of expertise suggests that novices appear to rely more on automated processes, while professionals tend to combine these processes with more deliberate strategies (Hallam, 1997).

Musicians can also process the information in different ways while encoding a musical piece. Several studies have examined the effects of different processing strategies used during learning on musical memorisation efficiency.

[6] In this case recall was poorer for the cue, improving with increased distance from it (Ginsborg & Chaffin, 2011a).

Encoding can be done all at once (*massed practice*) or over different periods of time (*distributed practice*). Rubin-Rabson (1940) was one of the first to investigate the effects of these two forms of encoding in musical memorisation. The author compared the effects of massed practice (memorising everything at one sitting) with two forms of distributed practice (distributed practice in the same day or over two days). Nine piano students, ranging significantly in ability, were asked to memorise excerpts from nine compositions covering varied styles of repertoire. The quality of retention when revising the piece was better for the two forms of distributed practice than for massed practice. However, no significant differences were found between the two types of distributed practice. Level of skill also appeared to be an influence, as distributed practice was particularly effective for less skilled learners, while both methods were fruitful for more experienced musicians.

Processing strategies have been also studied with regard to the amount of material assimilated. Early studies on musical memorisation compared two main approaches. The first involved memorising a musical piece in its entirety (whole approach), while the second required dividing the material into different parts (part approach). Results from earlier experimental studies were varied. Superiority of whole approaches was found by Brown (1928), Clapp (1924) and Eberly (1921), while segmented proved to be more effective in a study by O'Brien (1943). Rubin-Rabson (1940) found the strategies equivalent. The main limitation of these studies is the size and consistency of the material examined. The "whole" approaches did not involve entire pieces of music, but very short musical excerpts. Moreover, segmented approaches included even shorter segments, not necessarily musically meaningful. Later, other researchers started incorporating longer musical excerpts, more related to musical pieces.

Mishra (2002) identified four main processing strategies used by graduate students to memorise a short piece of music: (1) *holistic* – related to the whole approach; (2) *segmented* – related to the part approach; (3) *serial* – similar to the holistic, but involving starting again from the top every time a mistake was made; and (4) *additive* – similar to segmented, but in this case the musician does not focus separately on each segment before integrating them into a whole. After assimilating a new segment, the musician goes back to review the previous material. In this study, the *holistic* and *additive* strategies were associated with faster speeds of memorisation.

Although Mishra's (2002) results were analysed qualitatively, the author subsequently tested the efficacy of these strategies experimentally (Mishra, 2011). Forty brass and woodwind graduate students were asked to use one specific type of strategy (assigned randomly) to memorise a short and relatively simple musical exercise. The strategies associated with faster retention were the holistic and additive. Mishra (2011) also asked the subjects to perform the piece by heart after a 5-minute retention interval, with the intent of examining memory stability. In this case, no significant effects were found for the number of errors in performance related to each strategy.

The superiority of holistic and additive strategies found in Mishra's (2011) study should be interpreted with caution. On the one hand, the musical exercise used in the experiment is very short and relatively simple. One may wonder if practising from beginning to end will be as efficient for longer and more complex pieces. Moreover, the strategies in Mishra's (2011) experiment are considered in isolation (the musicians could only use one strategy). However, musicians appear to also rely on the combination of these methods (Chaffin & Imreh, 2001; Hallam, 1997; Williamon et al., 2002). More research is needed to investigate the effects of combining two or more strategies on memorisation efficiency. Finally, although Mishra (2011) attempted to consider memory stability as a variable, this was made only after a 5-minute retention interval. In natural settings, musicians often perform after greater retention periods. Subsequent research could address the effects of these strategies on memory stability after greater retention periods.

When processing the material provided by a musical score, different types of stimuli surround musicians. Executing a piece of music requires performance of complex motor movements at the instrument, reaction to the sound that is produced, response to the visual information provided by the score and the playing environment, or reliance on previous knowledge of the stimuli provided. Responses to these different stimuli appear to develop different types of memories (kinaesthetic,[7]

[7] Kinaesthetic memory, also reported as tactile, motor, finger or muscular memory is usually developed through repetition of "a bar, a phrase, or page until it can be played […]by 'feel'" (Ginsborg, 2004, p. 129). This memory "allows actions to be executed automatically" through "feedback from joints, muscles, and touch receptors" (Chaffin et al. 2009, p. 355).

auditory,[8] visual,[9] conceptual[10]) and different modality-specific memorisation strategies (Ginsborg, 2004; Rubin-Rabson, 1940b).

Perhaps due to the methodological constraints of isolating different stimuli, research investigating the effectiveness of modality-specific strategies is still very scarce. Some studies have compared the efficacy of memorising by ear (solely based on auditory stimuli) with using the score as visual aid. Results suggest that memorisation solely based on auditory stimuli develops more slowly than when the visual element of the score is present (Aiello & Williamon, 2002; Dakon, 2011). However, these studies were conducted only with string players and with short and simple musical excerpts. More research is needed to investigate how modality-specific strategies are implemented across different instruments, pieces of varied lengths and complexity, or across different levels of expertise. Moreover, it would be interesting to explore how musicians employ different modality-specific strategies when the musician is less familiar with the surrounding stimuli.

Some types of memory, such as kinaesthetic memory, are mainly developed by physically playing the instrument. However, memorisation strategies can also be developed through the use of mental practice.[11] Techniques reported in literature include "analysis of the score, listening to recording of the piece, auditory imagery of the pitches, movement imagination (visually and/or kinaesthetically) or visual imagery of the score" (Bernardi et al., 2013, p. 20). Studies investigating the effectiveness of mental practice on musical memorisation have suggested that the isolated use of this practice can result in successful memorisation. However, when compared with physical rehearsal, it produces poorer performances (Bernardi et al., 2013; Highben & Palmer, 2004; Lim & Lippman, 1991). Nonetheless, the combination of mental and physical practice has been revealed to be effective (Coffman, 1990; Ross, 1985), leading to similar performance success as those based only on physical practice (Theiler & Lippman, 1995). Several studies have

[8] Auditory memory is often related to individuals' ability to hear the music in their heads (Chaffin et al., 2009, p. 355).
[9] Visual memory usually refers to the ability to see specific parts of the musical score even when it is not physically present or being able to visualize "the position of the instrument and of the body" (Ginsborg, 2004, p. 130).
[10] Conceptual memory has been defined as "the musician's existing semantic knowledge – held in long-term memory – of the structures that underlie the music" (Ginsborg, 2004, p. 132).
[11] Mental practice, also referred to as mental rehearsal and mental imagery, is considered in this thesis to be all type of imaginary rehearsal not involving physical playing at the instrument (Clark et al., 2012).

emphasized the important role of forms of mental practice to memorisation, in particular musical analysis of the score (Chaffin & Imreh, 1997; Ginsborg, 2002; Hallam, 1997; Rubin-Rabson, 1937).

The studies discussed above have contributed to gradually laying the groundwork for understanding musicians' approaches to memorisation. However, most studies are focused on general approaches to memorisation. Research focusing on specific styles of repertoire is highly based on tonal repertoire.

1.4.2 Memorising Non-Tonal Music

The first decades of research on musical memory focused mainly on the memorisation of tonal music. Nevertheless, memorisation of non-tonal repertoire has recently captured the attention of researchers (Chueke & Chaffin, 2016; Soares, 2015; Tsintzou & Theodorakis, 2008).

Tsintzou and Theodorakis (2008) were among the first to explore memorisation strategies used with non-tonal piano music. The authors observed five pianists of different levels of expertise memorising a short excerpt of a non-tonal piece by Mahnkopft over a one-hour session. Subjects included two piano students, two piano teachers and one professional pianist with many years of experience in performing contemporary music from memory. The most experienced pianist also provided comments during practice and participated in an open-ended interview after completing the memorisation of the excerpt. Results revealed a relationship between the quality of the final performance and the level of expertise. The quality of the memorised performance decreased from the expert to the students. Moreover, similarly to other studies (Williamon & Valentine, 2002), experienced performers segmented the piece more consistently than those who were less experienced.

This was one of the first studies examining the role of expertise level in the memorisation of non-tonal repertoire. However, some limitations can be pointed out. The study focused on a very small sample and a very short musical excerpt. Moreover, the evidence was only collected during a one-hour practice session. Such setting is not representative of musicians' normal process of memorisation of entire pieces over long periods of time. Finally, examination focused mainly on segmentation strategies, neglecting other memorisation strategies.

As previously mentioned, two longitudinal case studies by Soares (2015) and Chaffin and Chueke (2016) examined memorisation of musical excerpts by Messiaen and Schoenberg and provided evidence for the use of hierarchical retrieval structures based on personal understanding of musical structure and different types of PCs in this context.

Soares (2015) also provided qualitative examination of specific techniques used by himself and other pianists to memorise a wide range of non-tonal piano pieces. Some strategies resembled previous studies, namely the use of segmented practice (Chaffin & Imreh, 1997; Ginsborg, 2004; Mishra, 2002, 2011; Williamon & Valentine, 2002) or pre-analysis of the score (Aiello, 2000; Hallam, 1997; Rubin-Rabson, 1937). However, some pianists used less common techniques to deal with the complex demands of this type of repertoire. One musician used the *Pomodoro Technique*. This strategy consists of distributing practice in spaced intervals, interposed with rest periods. Two musicians reported using coloured annotation of musical dimensions to highlight important details on the score (Soares, 2015).

One interesting technique found in this study and also reported by Tsintzou and Theodorakis (2008) was the association of non-tonal information with tonal music knowledge (e.g., intervalic or harmonic relationships). Soares (2015) also emphasized the importance of relying on localised cues of different types (e.g., intervals, hand shapes, sound features) as an aid to memorisation.

The studies on memorisation of non-tonal music described above open the doors to the understanding of how musicians cope with memorisation of challenging compositions. However, the majority of studies so far have been mainly confined to brief excerpts. Soares (2015) includes an examination of his own approach to entire non-tonal pieces, but most of his studies lack triangulation of self-reports with behavioural data.

Memorisation of non-tonal music has also been addressed in studies with musicians with exceptional musical memories. Based on their extraordinary memory feats, one would expect to be treated with brilliant memorised performances. However, previous studies of musical savants have found that this is not the case. Savants' performances appear to be influenced by the presence or absence of tonality.

Sloboda et al. (1985) asked a savant to learn a tonal piece by Grieg and a whole-tone piece by Bartók. An astonishing difference of error rate between the two pieces was found (8% for the tonal piece, 63% for the whole-tone piece). This study

was further replicated with other savants, with differing results. Miller (1989) replicated the study with a visually impaired young pianist, revealing that 72% of the Grieg and 37% of the Bartók were accurately recalled. Still, there was a significant difference in fidelity between the two pieces. This difference was less evident in a subsequent study with an autistic savant done by Young and Nettelbeck (1995). In this case, the Grieg was almost perfectly replicated and the quality of reproduction of the Bartók was not much different than the tonal piece. However, once again, the savant found Bartók's music more difficult than the piece by Grieg.

Although these studies are the first to provide evidence for the influence of enculturation and familiarity in musicians' recall of complete pieces of music, one may argue that results could be even more significant if the other piece were to be truly atonal. Ockelford (2011) argued that a whole-tone piece could not be considered as atonal music. Therefore, he replicated the study with two different pieces. This time one was an atonal excerpt from Schoenberg's *Klavierstück,* op. 11, no. 1 and the other was a tonally equivalent piece especially composed for the study. Once again, this savant also struggled more with the atonal piece than its tonal equivalent. The savant's struggle with the atonal music was evident from the first recall attempt. Ockelford (2011) describes how surprised he was with the results:

> Here was someone who had shown that he could consistently dissemble highly dissonant nine note clusters with a striking immediacy and over 93% accuracy, and whose public piano performances were characterized by precision. Yet here, in an excerpt of textural and technical simplicity, Derek played the very first note incorrectly, substituting a fifth octave C for the original fourth octave B. I was listening to Derek's efforts at the time (rather than watching him play), and what I heard seemed so unlikely that I felt obliged to check that the keyboard had not somehow slipped into transposing mode. But he really had made a mistake, and the errors continued… (Ockelford, 2011, p. 270).

What is curious about this study is that it gives an example of how the musician dealt with this difficulty. Ockelford (2011) found that the musician felt the need to impose conventional structures on the piece by Schoenberg, "altering pitches so they fitted within a quasi-tonal framework" (Ockelford, 2011, p. 237). The use of tonal music knowledge to aid memorisation of non-tonal music has also been reported in the studies reviewed above.

These studies on memory of musical savants demonstrated that memorisation is a process of reconstruction and highlight the important role of enculturation and familiarity with the musical language of a piece of music in this process. However,

they are focused on single individuals with atypical abilities that are not generalisable to most musicians. More studies with a larger sample of musicians of different levels of expertise can provide further insight into these issues. On the other hand, the task performed in these studies is also atypical for most musicians trained in the Western music tradition. Learning is solely based on aural stimuli received by recordings of the piece.[12] This type of encoding is not so common in Western music training, as musicians often use the score to first encode the information. Subsequent research is needed to further investigate if this disadvantage found with non-tonal music would also extend to memorisation approaches using the visual aid of the score during encoding. Finally, all pianists from these studies were more familiar with tonal music. What would happen with professional musicians who have played large amounts of non-tonal repertoire? Would the experience thus acquired have any influence?

1.5 AIMS AND RESEARCH QUESTIONS

The wide range of studies presented and discussed above illustrates how research in human memory, expert memory and musical memory has developed. This extensive body of research has brought us closer to an understanding of this fascinating topic, but more studies are needed to explore memorisation in non-tonal music. Following the first steps of previous research on this topic, the present thesis aims to provide deeper insights into memorisation processes developed in this context, investigating this formal question:

> How does memorisation unfold in the context of piano music with complex or imperceptible structures and non-tonal language?

This broad question can lead to several areas of inquiry. This thesis will focus on the following research questions:

> (RQ1) What are the attitudes of pianists towards performing non-tonal music from memory?

[12] The task, commonly defined as a *listen and play* protocol consists of listening to recordings of the excerpt and play at the piano as much as one can remember (Ockelford, 2011).

(RQ2) What obstacles do pianists face when preparing non-tonal music for memorised performance?

(RQ3) Which learning and memorisation strategies do skilled musicians use when preparing non-tonal music for memorised performance?

(RQ4) How do the principles of expert memory apply to the memorisation of non-tonal music?

(RQ 4a) Do pianists engage in meaningful encoding of musical material even when tonal language is absent?

(RQ 4b) How do pianists develop retrieval schemes in this context?

(i) How are retrieval schemes organised?

(ii) What types of retrieval cues are developed?

(iii) How do retrieval structures develop and change as musicians learn compositions for performance?

(iv) Do musicians engage in extensive practice of those structures?

These four research questions are addressed in three main studies, which will be further described in the end of the following chapter. First, Chapter 2 will review existing methodological approaches in the study of memory, with particular focus on research on musical memory. This review will set the context for a detailed presentation of the rationale behind the methodological procedure employed in the empirical studies of this thesis.

2 METHODOLOGICAL REVIEW

2.1 INTRODUCTION

The present chapter provides a framework for the methodological procedure underpinning the empirical studies within this thesis.

Attempts to understand how human memory works date back to the philosophical inquiries of Plato (428?–347? B.C.) or Aristotle (384–322 B.C.) and have long been a leading topic in several research fields (Radvansky, 2017). Even in recent times, however, the investigation of human memory has faced several obstacles. The structures and internal processes of memory cannot be observed externally. Therefore, researchers search diligently for the most efficient methods to grasp such intricate phenomena (Lockhart, 2000). Although philosophers were the first to develop theoretical accounts of how human memory operates, the understanding of this mechanism only became a chief topic of interest for psychologists in the latter half of the nineteenth century. Recent studies on human memory are largely influenced by methods developed by prominent psychologists such as Ebbinghaus ([1885], 1913) and Bartlett (1932).

Ebbinghaus ([1885], 1913) was one of the first to develop methodological approaches for the experimental study of human memory, using himself as the main subject. Because his intention was to study memory in the purest form, without the influence of previous knowledge, he used about 2300 trigrams as his main material. Trigrams are groups of three nonsense syllables (consonant-vowel-consonant). The basic approach of his experiments was to read through a separate series of trigrams from beginning to end. The series would then be recited by heart, also in a serial order. If hesitations occurred, the subject was not allowed to start over. According to Ebbinghaus "there was a perfectly free interchange between the reading and the occasionally necessary tests of the capacity to reproduce by heart" (Ebbinghaus, [1885], 1913, p. 24). Reading and recitation was to be performed at a constant rate of 150 strokes per minute, measured by the ticking of a watch. Ebbinghaus also implemented a retention interval of 15 seconds between the learning of separate series, using that time to tabulate the outcomes. His findings largely contributed to

the understanding of basic principles of human memory and generated influential concepts such as the *learning curve*, *forgetting curve*, or the *savings-effect* (see Lockhart, 2000 for a complete review).

Bartlett (1932) also pioneered important approaches in the study of human memory. This psychologist developed a method known as *serial reproduction* to study the influence of prior knowledge on memory (Hayes, 2000). Subjects were asked to read or hear a story and later recreate it at various points in time (from immediately after the reading to several months or years later). During the recall process, participants tended to omit and simplify the story, or even to transform the content into a more familiar or conventional form. His findings indicate that prior knowledge affects the formation of memories. Bartlett (1932) suggested that information stored in memory tends to be fragmentary and incomplete and that individuals reconstruct the information based on their prior knowledge of related experiences and events. This premise has been supported by subsequent studies with musical savants discussed in the previous chapter.

The first half of this chapter discusses methods used in the field of psychology to investigate memory, focusing on music memory research. The second half outlines and justifies the methodological approach adopted in the empirical studies of this thesis.

The pioneer work of researchers such as Ebbinghaus ([1885], 1913) and Bartlett (1932) founded the basis of methodological approaches currently employed in the study of human memory (Radvansky, 2017). Currently, Ebbinghaus' approach to learning and retrieving lists of items is commonly used in this research area.

The use of modern computers has significantly improved Ebbinghaus's methods, as researchers can now more easily assign the order of the items and prescribe their presentation rates, while also measuring participants' response time (Kahana, 2012). Neuroscience has also gradually introduced new devices to measure physiological responses and explore the activation of different brain regions during memory tasks (Slotnick, 2017).

When exploring the different paradigms used to investigate human memory, one is confronted with an overwhelming number of possibilities, according to the memory facet under investigation. A complete review of these methods is beyond the scope of this thesis. Therefore, the review will briefly outline leading methods in memory research, focusing mainly on the study of musical memory (see Greene,

2014; Kahana, 2012; Lockhart, 2000; Puff, 1982; Westerman & Payne, 2008 for more complete reviews).

2.2 METHODS APPLIED IN THE STUDY OF HUMAN MEMORY

Numerous studies on human memory have been based on experiments in laboratory settings. In most common designs, researchers manipulate variables of interest and measure the resulting effects. In general, experimenters manipulate the items to be remembered or the processes involved in the memory task. Later, they examine the act of retrieving the information and make inferences from these results (Radvansky, 2017). The procedure of most experimental memory tasks follows three main stages: study phase, retention interval and retrieval test (Lockhart, 2000). The different procedures applied in these experimental phases vary according to the memory effects under investigation.

Psychologists often assess the contents of memory through retrieval tasks. Several aspects of retrieval can be explored, such as features of the remembered items (e.g., quantity, position, length, meaning or structure, among others) or behavioural factors (e.g., response time). Even though retrieval is the final phase of the memory experiment, the type of responses measured at this stage largely influence the procedures applied in the previous steps (Lockhart, 2000).

The most commonly used retrieval tasks are recall and recognition. In recall tasks, subjects usually learn a list of items (e.g., words, visual stimuli, melodic combination or stories) and are instructed to reproduce them in a subsequent test. The researcher can control the order in which stimuli can be retrieved by asking participants to reproduce the learned items in the exact order (serial recall), or in any order (free recall). Serial recall is commonly used to study the effects of list length or list position on probability of recall, while free recall has been used to give insight into the effects of different rehearsal strategies such as overt rehearsal (Müllensiefen & Wiggins, 2011).

In recognition tasks, researchers examine the subject's "ability to remember whether or not a presented item has occurred in a particular context" (Kahana, 2012, p. 32). Several recognition tests are composed of two main phases. In the first phase, participants learn a list of items (e.g., words, pictures, musical pitches). In the second

phase, a new list containing just-studied items and new information is presented. At this stage, participants are asked to recognise the just-studied items in the new list. Participants' recognition can be manipulated in different ways by controlling the type of responses given. For instance, subjects can be asked whether a certain item belongs to the just-studied list (*yes-no recognition tasks*) or requested to select the just-studied items from a list of possible choices (*forced-choice recognition*). In general, performance in laboratory recognition tasks is better than in recall tests, with a few exceptions (see Kahana, 2012 for a more detailed review).

The methods addressed so far are usually focused on manipulating the retrieval stage. However, several other experimental tasks also manipulate the encoding and interval phases. The conditions of the study phase can be manipulated by altering different aspects of the environment or the cognitive states of the subjects during encoding. These tasks have been used to examine the relationship between processes of encoding and retrieval (see Mishra & Backlin, 2007 for an example of this type of study in music).

If researchers are interested in studying interference effects between encoding and retrieval phases, they manipulate the interval between these two stages. The retention interval can be controlled in terms of interval durations (which can last from seconds to years) or the nature of the events presented. The incorporation of stimuli in the retention interval serves several purposes, such as preventing the participants from rehearsing before the retrieval task, or causing several types of interference with the previously learned material (Lockhart, 2000).

Finally, the attributes of the stimuli or the processes involved are not the only variables manipulated in the study of memory. The attributes of the subjects, such as gender, age or experience, can also be taken into account. A significant body of research has explored the differences in memory performance between groups with different attributes. This is the case of research into expert memory, in which memory performance is assessed across groups of different levels of expertise (Gobet, 2015).

The methods reviewed above have largely contributed to the current foundational knowledge of how memories are encoded, stored, retrieved or how they decline over time (Baddeley, 2010). Their application can be often found in experimental studies in which researchers manipulate specific variables under strictly controlled conditions, in order to regulate the influence of extraneous factors. One of the main criticisms identified in controlled experimental designs is their inability to

fully grasp the development of memory in everyday-life contexts. As researchers attempt to control the effects of peripheral variables, they end up altering the essence and context of the phenomenon under investigation (Wilson et al., 1989).

In response to these limitations, some researchers have advocated the investigation of memory in more naturalistic and everyday-life environments.

Neisser's (1978) views on this matter were largely influential and helped disseminate a research trend often referred to as *everyday memory* research. His influential papers questioned the generalisability of laboratory findings to real-life situations and argue that a more complete understanding of human memory requires emphasis on observations in the real world. According to Neisser (1978), researchers at the time were too preoccupied with broader theoretical issues, disregarding relevant topics. These would include individual differences in memory performance, forgetting appointments and childhood memories, among others. Moreover, he noticed that the materials under investigation (e.g., nonsense syllables) and the artificial laboratory environments were very distinct from real-life contexts. Based on these arguments, his papers questioned the ecological-validity of laboratory studies and advocate a new trend of research to examine memory in everyday-life situations.

Neisser's ideas originated a new research movement that has been addressed as *ecological*, *naturalistic*, *real-life* or *everyday* memory research (see Kvavillashvili & Ellis, 2004 for a review). This approach is usually characterised by the use of authentic everyday phenomena (e.g., flashbulb memories, eye-witness testimony, metamemory, prospective memory, tip-of the-tongue phenomena, face recognition and exceptional memories, among others) in more naturalistic settings (Neisser, 1982). Moreover, it aims to investigate concrete and practical problems found in daily routines, as opposed to developing and testing abstract models of human memory (Yuille & Wells, 1991). Originally, the methods used in ecological and experimental approaches tended to be quite distinct, with the former often relying on less rigorous approaches in more naturalistic settings (e.g., the collection of verbal reports about past experiences not controlled in length or content) and the latest on rigorous methods applied in laboratories.

Different findings obtained through the ecological and experimental approaches have incited the controversy between these two trends. A striking example is known as the recall-recognition paradox (Kvavillashvili & Ellis, 2004). As mentioned before, performance in recognition is usually superior to recall in experimental

settings. However, the opposite findings were revealed in more naturalistic settings (Lipton, 1977; Neisser, 1988). This discrepancy was used as argument for the importance of considering the context of inquiry when researching memory. However, Koriat and Goldsmith (1994) provided evidence that this pattern of results was due to the type of measurements used (accuracy versus quantity of memory) and not to the type of setting (experimental or naturalistic).

Nowadays, ecological and experimental approaches increasingly share methodological approaches, resulting in a mutual enrichment and peaceful coexistence (Kvavillashvili & Ellis, 2004).

A similar research development can be found when reviewing studies on musical memory. Some studies can be placed in the extremes of the experimental and ecological approaches, while others appear to be located in the middle ground.

2.3 METHODS APPLIED IN THE STUDY OF MUSICAL MEMORY

Prior to the beginning of the twentieth century, most literature on musical memory was based on anecdotal evidence or personal beliefs (Hughes, 1915; Matthay, 1926). However, music psychologists became interested in this area and, since that time, have developed several methods to observe, record, interpret and predict how music is memorised (Lehmann, 2002).

Two broad topics are often addressed in the study of memory, and more particularly in research on musical memory. The first embraces the study of memory characteristics when pitch information is being processed (see Müllensiefen & Wiggins, 2011 for a review). The second is related to the dynamic processes and strategies involved in the formation of memories during the learning of musical works. Due to the limited scope of this thesis, this review will focus on the second topic.

Memorisation strategies have been defined as "techniques specifically tailored to help the learner store new information in memory and retrieve it later" (Oxford & Crookall, 1989, p. 404). Particularly since the beginning of the 20th century, a growing body of research has identified and tested the efficacy of these strategies in the musical domain, mainly through experimental and observational studies, interviews and questionnaires.

2.3.2.1 Experimental Studies

Several experimental studies have been designed to test the effectiveness of memorisation strategies. The most common task consists of asking subjects to learn and memorise a short musical piece or excerpt under strictly controlled conditions, culminating with a memorised performance. Usually the researcher manipulates the type of strategy used. Memorisation strategies examined to date include analytical pre-study (Rubin-Rabson, 1937), massed or distributed practice (Rubin-Rabson, 1940a), different forms of mental rehearsal (Highben & Palmer, 2004; Lim & Lippman, 1991; Rubin-Rabson, 1941), or more specific strategies, such as combining or separating words for singers (Ginsborg & Sloboda, 2007). The effectiveness of these strategies has then been assessed by measuring their effect on number of learning trials (Ross, 1985; Rubin-Rabson, 1940b), or on measures of accuracy or other musical aspects examined during memorised performance (Ginsborg, 2002; Highben & Palmer, 2004; Lim & Lippman, 1991; Mishra, 2010b).

The experimental tasks are usually performed under rigorously controlled conditions, in order to avoid the influence of peripheral factors. Controlling for such extraneous elements gives the researcher greater confidence in claiming that the results obtained can be attributed to the manipulated variables. However, this type of control usually prejudices the natural conditions of the task under investigation. First, experimental tasks are usually based on simplified and short materials, as they are more easily analysable and comparable across participants and different conditions (Palmer, 1997). Second, the tasks are usually performed in short periods, during which musicians are given limited time to practice and perform. Studying the process of memorisation of small and simple melodic excerpts during short periods of time is hardly comparable to the thorough preparation usually carried out by musicians to learn and prepare entire pieces of music (Williamon, 1999a). For this reason, although experimental studies have made a large contribution to our knowledge and understanding of memorisation strategies and their effectiveness, they give limited insight into the complex activities of performing from memory.

Consequently, research in this area has increasingly started to use exploratory studies based on non-experimental designs (Palmer, 1997). The present review will now focus on questionnaires, interviews and observational methods.

2.3.2.2 Questionnaires and Interviews

Questionnaires and interviews have been used to identify and explore musicians' experiences, views and practices of performing from memory. Some studies have used questionnaire surveys to explore the use of memorisation strategies across large samples of musicians (Davidson-kelly, 2014; Herrera & Cremades, 2014). Additionally, similar tools have been used to examine quantitatively the correlation of memorisation strategies with specific learning styles (Mishra, 2007). Even though questionnaire surveys are useful to document strategies used by a large sample of musicians, they do not provide comprehensive and rich reports of the musicians' use of such techniques. Moreover, as researchers are not face-to-face with the participants, they cannot known whether respondents correctly understood the questions and follow up on and explore a subject's answers in further detail.

More comprehensive and rich descriptions have been collected through face-to-face interviews. This method is commonly used in phenomenological studies focusing on how subjects attribute meaning to their own experiences (Aiello, 2000; Chen, 2015; Hallam, 1997; Holmes, 2005). Semi-structured interviews is the approach most commonly used, due to its potential to obtain in-depth accounts of musicians' memorisation approaches. By avoiding *yes-no* and short answers, this type of interview elicits rich accounts of the topic under investigation.

Professional musicians are often a sample of choice in this type of study. Experienced musicians appear to have "well-developed metacognitive skills, including self-awareness of strengths and weaknesses, extensive knowledge regarding the nature of different tasks and what would be required to complete them satisfactorily, and strategies which could be adopted in response to perceived needs" (Jørgensen & Hallam, 2016, p. 456). For these reasons, they are a suitable sample for enquiries on strategic memorisation. Moreover, their insights can contribute highly to the development of pedagogical strategies to train less experienced musicians. Nevertheless, one may argue that a focus on novices' views and practices of performing by heart will also help understand how they differ from more experienced musicians and how they can be trained to further develop their abilities (Hallam, 1997).

Some interviews have focused on general approaches to memory (Hallam, 1997); others have asked directly about specific strategies, such as imagery (Holmes,

2005) and yet others have focused on approaches to specific styles of repertoire (Chen, 2015). Aiello (2002) also used an interesting method to obtain clearer and simpler descriptions. Instead of asking professional musicians about their own strategies, the participants were asked to propose effective techniques for piano students to memorise musical works.

Both questionnaire and interview studies have contributed to the documentation of a range of memorisation strategies. As an example, pre-analysis of the score is a strategy recurrently mentioned in the studies reviewed above, and is now highly recommended in literature on music teaching (Aiello & Williamon, 2002; Ginsborg, 2004; Hallam, 1998). However, the use of self-reports as a research tool has often encountered criticism among researchers. The most heated debate is related to the validity of self-reports. Research on human memory has suggested that individuals tend to reconstruct and simplify their memories of experiences based on their previous knowledge (Bartlett, 1932). It is possible that self-descriptions do not completely correspond to the actual reality. In fact, studies combining musicians' verbal reports with systematic observation have found inconsistencies among those sources of data (Gobet, 2015). Moreover, self-reports are often too general or not consistent enough, thus hampering evidence interpretation (Chaffin & Crawford, 2007).

Some researchers have addressed these limitations by combining musicians' accounts of their experiences with actual observation of musicians' behaviour during practice.

2.3.2.3 Observational Studies

Researchers have used observational methods to closely investigate preparation for memorised performance under relatively natural conditions. In this type of studies, several methods have been developed to observe and systematically examine on-going behaviour. Unlike experimental designs, the researcher's intent is to observe a specific phenomenon as close as possible to reality, without simulating or controlling the subject's behaviour.

Some observational studies have focused on single case studies (e.g., Chaffin et al., 2010; Chaffin & Imreh, 2002), and others on observation across groups (Ginsborg, 2002; Williamon & Valentine, 2002). The case study method has been

widely used to track musical memory development. Roger Chaffin and colleagues have performed a recognised body of longitudinal case studies tracking professional musicians' approaches to memorisation of specific musical works. Their studies thoroughly examine musicians' entire process of preparation of a musical work for memorised performance. The learning process is observed from the moment the musician starts working on the piece until it is performed. Additionally, long-term recall is investigated through free recall tasks months or years later.

The observation of the learning process is conducted through analysis of video recordings of all practice sessions and the final performance. The use of video or audio recordings has also been used as an observational tool by several researchers investigating practice and memorisation approaches (Ginsborg, 2002; Gruson, 1988; Miklaszewski, 1989; Williamon & Valentine, 2002).

Observation through video recordings has several advantages when compared with live observation. Video recordings are relatively simple to use and can be set up by the subject under investigation. For this reason, participants are free to maintain their useful practice routines, thus preserving the naturalistic conditions of the study. Moreover, as the researcher is not physically present, the musicians' discomfort of having someone observing their practice may be reduced. From the researcher's perspective, recorded material has several advantages, as it can be reviewed multiple times and at various speeds, thus allowing focus on different aspects of behaviour in different viewings. Moreover, the use of video facilitates intra-observer reliability, allowing comparison of different analyses of the same material by different observers (Bakeman & Quera, 2011).

Nevertheless, several disadvantages can be also pointed out. First, video recording data may be easily lost due to problems with the camera or lack of storage (Chaffin et al., 2002). Second, camera angles or distance from the subject may obstruct or distort the image (Bisantz & Drury, 2005). Finally, some details may be not easily accessible. For instance, even though the pianist seems to be looking at the score, the recording cannot capture exactly the section of the score they are focusing on.

The subjective and personal experience of learning and memorising a musical piece may not be easily grasped solely by observation of video recordings of practice. Chaffin and colleagues counterweigh this limitation by collecting other sources of data. Besides recording practice, they also collect musicians' self-reports (verbal

reports and annotations on the score). Verbal reports are usually collected while performing the task (concurrently) and after the task is completed (retrospectively). Concurrent comments are typically obtained by asking the participant to think aloud during practice (e.g., Chaffin & Imreh, 2001). The *think-aloud method* has been largely used in research on problem-solving, and particularly on research into expert memory (Ericsson, 2006). This approach consists of asking participants to verbalise their thoughts while completing a task or solving a problem (Someren & Sandberg, 1994). Collection of contemporaneous reports has been considered an effective strategy to capture thought processes that appear spontaneously while solving a task (Ericsson & Simon, 1993).

Nevertheless, relying solely on concurrent reports also has limitations. Chaffin and Imreh (2001) compared concurrent reports with retrospective reflections and practice behaviour, and noticed that the former did not reveal all the details that turned out to be important during practice. The authors noticed that concurrent reports tended to focus mainly on problem-solving issues, leaving aside less problematic aspects of practice. For the reasons mentioned above, combining concurrent and retrospective reports can provide a more comprehensive picture of the learning process.

In order to be as comprehensive as possible, the longitudinal case study approach triangulates concurrent, retrospective reports and behavioural data extracted from video recordings of musicians' practice. The combination of these different sources of data provides robust evidence about how musicians approach learning and memorisation. On one hand, systematic observation of behaviour validates musicians' reports, by confirming whether the reported goals are actually being attended to during practice. Additionally, it can help unveil other goals neglected in the reports, "either because they were too automatic, too complex, too ineffable, or simply because they were less salient than other goals" (Chaffin & Imreh, 2001, p. 40). On the other hand, self-reports can themselves help understand the behavioural record, which may not be as easily interpreted by an external researcher who is not involved or has no practical knowledge of the task.

Chaffin and colleagues have analysed practice behaviour by transcribing the video recordings of practice sessions. Demos & Chaffin (2009) designed SYMP (Study Your Music Practice), a free-access software tool very useful for transcribing and analysing musical practice. This tool, written in Microsoft Excel 2007/2010,

transcribes practice data into a spreadsheet, by annotating the location of starts and stops and other aspects of practice (e.g., practice performed with or without the score, with separate hands or hands together, or other practice goals). From these transcriptions, the software generates graphic summaries of practice sessions and numerical values (e.g., number of starts, stops and repetitions), which are later used to perform statistical analysis.

The statistical model first used by these researchers to assess the relationship between self-reports and practice data was *Multiple regression analysis.* (Chaffin et al., 2010, 2013; Chaffin & Imreh, 2001). To perform this type of analysis, researchers draw predictor variables from the musicians' self-reports and outcome variables from the practice behaviour. Predictor variables are based on categories of musical features reported by the musician as being important to their practice and performance (e.g., basic, interpretative or expressive features). Outcome variables include frequency of starts, stops, repetitions or hesitations during the first attempts to play from memory (Chaffin & Imreh, 2002). Moreover, for even more robust evidence about the memory process, outcome variables can also include the probability of recall in long-term recall tasks. Significant effects indicate the aspects of the piece that received the most attention during practice and can be used to validate musicians' self-reports.

Although the use of traditional inferential statistics has strengthened the analysis of evidence by validating musicians' self-reports, it is important to acknowledge its constraints. Statistical models based on general linear models usually assume independence across different observations. However, studies examining time-series data (e.g., sequentially organised practice sessions) do not deal with independent observations. One cannot assume that practice sessions are independent, as each trial session may affect the subsequent ones (Demos & Chaffin, 2017). Additionally, it is not easy to find independent observations when musicians are practising a musical piece. As mentioned before, different hierarchical levels of a piece of music can be used as a basis for practice organisation (Williamon & Valentine, 2002). These levels are not independent, as beats are related to bars, which in turn are related to phrases and larger sections. Moreover, the traditional statistics mentioned above should ideally deal with constant (homogenous) variance across conditions. This condition is difficult to achieve when studying music practice and performance. For instance, phrases and sections reported by musicians usually diverge in length. Consequently, practice segments at different levels in the

hierarchical structure will possibly provide varied numbers of observations, thus affecting variability (Demos & Chaffin, 2017).

For the reasons mentioned above, Chaffin and colleagues have recently started using generalised mixed effects models to relate musicians' self-reports with behavioural evidence (Ginsborg et al., 2012; Lisboa et al., 2015).

In summary, Chaffin and colleagues have developed a very robust methodological approach combining qualitative and quantitative data to provide a comprehensive examination of the entire process of preparation for memorised performance. Nonetheless, their studies are based on single cases. Although this approach accounts for individual learning styles and subjective experiences and ensures that practice is explored in the greatest detail possible (Ericsson & Oliver, 1988), findings from case studies are specific to the musician and musical piece under investigation and cannot be generalised.

Williamon and Valentine (2002) and Ginsborg (2002) have collected this type of evidence in observational studies comparing practice and memorised performance across groups with different levels of expertise.

The first authors were particularly interested in examining the role of segmentation in the encoding and retrieval of music as function of skill level (Williamon & Valentine, 2002). Similarly to Chaffin and colleagues, participants performed a task in a setting as close to reality as possible. After dividing the subjects into different groups according to skill level, each group was asked to learn and memorise a piece by J. S. Bach. The number of practice sessions and strategies used during practice was not controlled. Similarly to the above-mentioned longitudinal case studies, the analysis of evidence also combined self-reports with empirical measures extracted from the behavioural data. Data from post-interviews was used to categorise bars from the piece according to their structural importance and complexity. Subsequently, the frequency of starts and stops in the different types of bars was computed for each participant.

One of the main challenges faced in this study was the comparison of data across participants, mainly related to the disparities across observations. First, each group was assigned a different piece with different number of bars. Second, the number of bars within different categories (structural, difficult or other) was different for each pianist. These differences could have a significant impact on the resulting frequencies of starts and stops. To overcome these between-level discrepancies, the

authors calculated scores equivalent to z-scores, reflecting the deviation between the observed and expected frequencies. The values of deviation between observed and expected frequencies were used as variables in a two-factor mixed analysis of covariance (ANCOVA) (see Williamon and Valentine, 2002 for further detail).

Ginsborg (2002) faced a similar problem while attempting to compare practice across singers of different levels of expertise. However, instead of controlling for the inconsistencies during the analysis process, Ginsborg attempted to control the amount of practice during the data collection. Participants were asked to learn and memorise a new piece, but within a limited number of practice sessions (six 15-minute practice sessions). Although this type of control may have simplified the analysis afterwards, a limitation similar to those previously discussed in relation to experimental studies in this area appears to also be true in this case. Such a controlled number and duration of practice sessions does not take into account different learning styles and can affect musicians' usual approaches to memorisation. The author notes, "once the singers had carried out all their practice sessions and the data had been analysed, it became apparent that the majority of participants had failed to accomplish successfully the task of memorising the song accurately" (Ginsborg, 2002, p. 63).

In contrast to Williamon and Valentine (2002), who focused mainly on segmentation strategy, Ginsborg (2002) actually compared the use of different types of memorisation approaches in her study. The author analysed nine different strategies emerging from the recordings of the practice sessions. The transcription process included identification of *attempts*[13] and its categorisation into different modes according to the strategy used. The identification of different strategies while transcribing practice allowed an exploration of the extent to which different groups used distinct numbers and types of strategy.

In summary, the observational studies reviewed above have complemented interview studies by including direct observation of what musicians actually *do* when practising. In this case, measures extracted from the practice behaviour complement musicians' self-reports to provide as much strong evidence as possible. Moreover, the preservation of naturalistic conditions for the task is also a priority among

[13] An attempt was considered to be an uninterrupted segment of practice. An attempt would start when the participant began speaking the words, humming the melody or singing both, and would continue until the singer stopped to make a verbal comment, repeat the passage or move on to the next one. Each attempt was categorised into a mode of attempt, according to the strategy used (e.g., speaking the text, singing the melody or vocalising, among others) (Ginsborg, 2002, p. 65).

observational researchers. This approach differs considerably from experimental studies, which attempt to control as much as possible the conditions task takes place under. Nonetheless, preserving the natural circumstances of such a complex task as memorising music has consequences. The freedom given to the participants when practising usually results in considerable differences across observations (e.g., number of practice sessions, length or type of strategy used). Therefore, the performance of within-level comparisons in this type of study is, even today, a great challenge in this research field.

2.4 SUMMARY

The previous section reviewed some of the most common methodological approaches employed in the study of musical memory. The review displayed the strengths and limitations of each methodological approach. Experimental researchers have struggled with developing tasks that capture the complex essence of musicians' practice and preparation for performance. Consequently, research on musical memory has a growing number of exploratory and non-experimental studies. The strengths of these studies include their potential to preserve, as far as possible, the natural conditions of musicians' preparation for performance, as researchers avoid imposing constraints during the process. However, their results are not easily generalisable, because they often rely on single cases or samples with very different experiences or learning styles (Palmer, 1997; Williamon, 1999a). The existing comparative studies often struggle with performing within-level comparisons.

By reflecting on the general and domain-specific limitations of the different types of methodologies employed in the studies reviewed above, one may argue that the best way to overcome these challenges is to combine the strengths of different methods, while simultaneously being aware of their weaknesses.

The following section will provide a general overview of the methodology employed in this thesis. More specific details about the methods used in each study can be found in the methodological sections of the subsequent chapters.

2.5 METHODOLOGICAL APPROACH EMPLOYED IN THIS THESIS

The methodological approach employed in this thesis is multimodal in nature, integrating different methods to explore in depth how pianists learn and memorise non-tonal piano works.

The first study is based on semi-structured interviews with professional musicians specialized in contemporary piano repertoire, which often moves away from tonality. Following an Interpretative Phenomenological Analysis approach (IPA), the study explores expert pianists' subjective views and experiences of learning and memorising this music. Subsequently, the remaining studies rely on longitudinal observational case study methods to closely investigate how pianists actually prepare non-tonal pieces for memorised performance.

Non-tonal music comprises a set of musical works that are very distinct in their nature and with a musical language that largely varies from composer to composer. Therefore, since encoding and retrieval of such intricate repertoire is hardly generalisable, the type of examination employed in this thesis is primarily exploratory. The individuality and subjectivity of each musician's approach is acknowledged throughout all studies. Patterns emerging from the data can be further investigated in subsequent studies and later tested through experimental designs. Interviews and observation were considered to be the most suitable methods in relation to the type of research questions identified in Subsection 1.5. The goal is to reconsider and extend existing knowledge about music memorisation, by documenting in great depth experiences of learning and memorising non-tonal piano repertoire. The next section will provide an overview and rationale for the three main studies of this thesis.

2.5.1 Rationale for Study 1

The first study reported in this thesis aimed to investigate professional pianists' views and experiences of learning, memorising and performing repertoire that breaks musical and performative conventions (e.g., use of tonal language, traditional formal structures or established performance practices). The study was based on semi-structured interviews with professional pianists who specialise in contemporary

repertoire, thus extending previous phenomenological research on music memorisation (Aiello, 2000; Chen, 2015; Ginsborg, 2000; Hallam, 1997; Holmes, 2005; Humphreys, 1993).

As mentioned before, experienced musicians usually have a broad knowledge of their skilled domain and can provide interesting and complete reports of their strategies (Jørgensen & Hallam, 2016). For this reason they provide a good initial source of information regarding learning and memorisation techniques applicable to non-tonal piano repertoire.

Given its exploratory nature, the scope of the first study was extended to include all types of contemporary piano repertoire. The methodological approach followed the IPA protocol proposed by Smith et al. (2009), because the theoretical constructs underpinning this approach and their respective methods of analysis were considered to be a suitable fit for the research questions under investigation.

The aim of IPA is to provide an in-depth exploration of personal experiences and examine how individuals make sense of their personal and social world (Storey, 2015). In music psychology, IPA has been increasingly used to explore subjective perceptions of lived musical experiences, including the learning of musical instruments at mature ages (Taylor, 2015), engagement in music therapy (Lee & McFerran, 2015) or perceptions and experiences during practice and performance (Clark et al., 2007; Holmes, 2005).

IPA is inspired by theoretical concepts from three main philosophical areas: *phenomenology*, *hermeneutics* and *idiography*. The phenomenological approach is anchored in the philosophical constructs proposed by Husserl, Heidegger, Merleau-Ponty and Sartre (Smith et al., 2009). Husserl was one of the first to highlight the importance of focusing on experience and on how individuals perceive it. His followers emphasised the idea that human beings are surrounded and immersed in a world filled with different objects, relationships, language, culture, projects and concerns. Such a line of thought turns the understanding of experience into a complex and unique process which, ideally, acknowledges the subjectivity of each person's intimate, embodied and situated relationship to the world (Smith et al., 2009).

This thesis assumes that knowledge is context-specific and influenced by the perceiver. Learning and memorisation of music are considered here as phenomena that should be interpreted within specific contexts. The primary intention is not to

generate a theory of how musicians memorise non-tonal music, but to understand how the phenomenon unfolds in this particular context.

Some theoretical insights behind IPA are also based on the philosophical movement hermeneutics. This philosophy embraces the interpretative elements of phenomenology in order to understand individuals' subjective worlds. The aim is to provide an interpretation able to disclose the real meanings of descriptions of experience, keeping in mind the relevance of the context. This study will follow this construct, aligning the interpretation as much as possible to the meanings attributed by the participants to their experiences, while simultaneously attempting to reveal motivations and understandings that participants cannot express as easily.

According to Smith and Osborn (2003), IPA is based on a *double hermeneutic*. This happens because although researchers attempt to get close to the subject's intimate world, they struggle to be completely neutral: they inevitably bring their own conceptions and experiences of the world to the interpretation. I strongly identify myself with how IPA situates the role of the researcher. I am a pianist with large experience of learning and memorising contemporary repertoire, and I am aware that my pre-existing knowledge and conceptions can have an active implication in the analytic process. By acknowledging this active role of the researcher, I used the methods proposed by IPA to help place myself as close as possible to the participants' views, while at the same time critically questioning their statements.

Finally, IPA is also idiographic, in the sense that it focuses on the particular experiences of individuals. This is a significant difference when compared with other areas of philosophy, which aim to generalise their findings and discover consistent rules of human behaviour (Smith et al., 2009). An advantage of the idiographic approach is that, by focusing on single reports, it allows the researcher to obtain in-depth descriptions of particular experiences and to account for their complexity and subjectivity. These in-depth and rich descriptions were considered invaluable for the initial stages of this thesis.

Because the study focuses on experiences of memorising through the eyes of the pianists interviewed, it is hardly generalisable. However, the inter-case comparison may lead to the identification of common patterns among the participants, which can then be further explored through other methodological approaches (see Smith et al., 2009 for a detailed review of theoretical constructs underpinning IPA). The common patterns among the participants are related to

findings from the observational studies of this thesis to provide a more complete understanding of how pianists learn and memorise non-tonal music.

For all the reasons mentioned above, IPA provided the methodological tools necessary to achieve the aims of such a study. A complete description of the methods used can be found in Chapter 3 (pp. 78-83).

2.5.2 Rationale for Study 2

Although interviews provide detailed accounts of musicians' experiences, they are based on the participants' idiosyncratic perceptions. Therefore, as argued by Chaffin and Crawford (2007), this thesis considers the importance of complementing self-reports in the form of interviews with observational methods. Observing musicians in action during practice allows documentation of what they actually do when preparing the pieces for memorised performance.

The second study reported in this thesis presents an observational large-scale longitudinal case study, which accompanied the author's entire process of memorising a commissioned non-tonal piece for prepared piano. This study aimed to extend existing findings of PC theory to complete non-tonal pieces and, for this reason, followed a protocol similar to previous longitudinal case studies (Chaffin et al., 2010b, 2013; Chaffin & Imreh, 2002). Practice and memorisation of a non-tonal piano piece were examined from the first moment of contact the performer has with the music until it is finally performed. The data collection comprised various sources of evidence, including behavioural data extracted from video recordings of practice, self-reports and a recall test. A thorough description of the methods is presented in Chapter 4 (pp. 120-129).

Soares (2015) and Chueke and Chaffin (2016) were the first to extend this theory to non-tonal piano repertoire. This study expanded their research on several fronts. First, it examined an entire non-tonal piece (12 minutes long), rather than short excerpts. Second, the piece was commissioned from a living composer, thus removing any available references from preceding aural or performative models in the work. Third, the music requires unconventional performance techniques, such as touching and plucking the piano strings on the soundboard. Finally, this study

examined for the first time effects of music features attended to during practice on long-term written recall.

A similarity to Soares' study (2015) is my simultaneous role of researcher and subject under investigation. Several reasons lie behind the choice of using my own practice as research. Being myself a pianist with experience of performing non-tonal music, I consider that my contribution to this thesis can go beyond the role of researcher, extending to the role of practitioner.

Research based on practitioners' reflections on their own practice is gradually winning ground within research on music performance and pedagogy. This type of inquiry has been often defined as *practice-based*, or *practice-as*, *practice-led* or *artistic* research (Ginsborg, 2014). Although the role of self-reflective research has caused heated debate among scholars, it has been thought to provide a good starting point to explore techniques and strategies used by musicians to prepare and perform musical works (see Ginsborg et al., 2012). When music practice and performance are the topics under investigation, researchers are dealing with unique and personal experiences. One may argue that a researcher who does not have the *know how* experience of engaging in music practice and performance will be hardly able to fully grasp the thought processes and behaviours of the participants.

In practical terms, examination of the entire process of the preparation of a long and complex musical work for performance requires substantial dedication, not only from the researcher, but also from the participants. Researchers have a personal interest in examining the chosen topic. They are fully committed to the study and have the time and motivation needed to engage with such task. However, for the performer, "there is little personal payoff for hours spent in research, as opposed to hours spent in repertoire building, performing, teaching, and recording" (Chaffin & Crawford, 2007, p. 159).

The initial aim of this study was to observe memorisation approaches to a non-tonal piece employed by different pianists. However, the recruitment of participants willing to engage in such time-consuming research was problematic. Moreover, the process of analysis of the entire learning process of such a long piece (12 minutes) soon revealed it to be unfeasible for more than one pianist. The possibility of using myself as the research subject solved several practical constraints and enabled the completion of such a thorough study.

Nonetheless, inescapable limitations are associated with a self-reflective study. Musicians develop particular thoughts and assumptions about their own processes of learning and memorising, and such previous expectations can hinder an objective interpretation of the data. Moreover, self-reports are subjective in nature and their interpretation can lead to mistaken assumptions.

The effect of my previous expectations for this study was avoided as much as possible by conducting the data collection at the very initial stages of research, before the direction of the thesis had even been clearly defined. At this stage, the roles of researcher and participant were disconnected as much as possible by simply focusing on my role as performer. Practice of the piece was incorporated into my usual routine, adding only the presence of the camera and an attempt to think aloud during practice. Annotations of musical decisions are a usual part of my practice routine. Therefore, the only difference was the use of different scores throughout the learning process. Only after performing the piece and undertaking the recall task 9 months after the performance did I adopt the role of researcher, focusing on transcribing and analysing the data.

During the analysis stage, the subjectivity of my self-interpretations of the data was avoided as much as possible through the use of objective methods of data collection and analysis developed by the psychologists contributing to PC theory. The triangulation of self-reports with objective examination of practice offers enlightened self-interpretations, as performers are able to take a step back and examine how their actual behaviour emphasises or contradicts their understanding of lived experiences. Additionally, the use of methods previously used in longitudinal case studies tracking memory development allows direct comparison of the findings with previous research.

One of the main challenges of adopting the role of researcher in this study was my lack of previous training in cognitive psychology. As my background is primarily in music performance, the major difficulty faced was the manipulation of objective measuring tools of practice behaviour and the development of statistical models to assess the relationship between behavioural measures and self-reports. Consequently, the first step was to search for training in this area and to ask for support and guidance from the researchers who developed the methods employed. The findings and discussions presented in this thesis are based on my own use of such methods to study my practice. However, the interpretration of the data involved discussions with

researchers Roger Chaffin and Alexander Demos. A collaborative interpretation of the findings is being prepared with these researchers for future publications.[14]

Finally, it is important to acknowledge that I was familiar with PC theory before this study and employed the PC strategy very often while memorising different types of repertoire. Therefore, a subsequent study was conducted with different pianists unfamiliar with PC theory in order to validate and extend results from this study.

2.5.3 Rationale for Study 3

Study 3 extends findings from the self-case study described above to a short piece following dodecaphonic principles of composition and to other pianists. PC theory has collected extensive evidence on how musicians develop retrieval structures and define landmarks (PCs). Some studies have compared approaches from the same musician to different types of repertoire (Chen, 2015; Ginsborg & Chaffin, 2011a). However, one aspect that has been less explored in PC theory is the examination of retrieval structures and PCs across different musicians for the same piece of music.

For the first time, the longitudinal case study approach is used to examine different musicians memorising the same piece. The multiple case study design was considered to be the most appropriate approach to fulfil the aims of this study because it provides a complete and thorough examination of each selected case, while simultaneously illustrating different perspectives on the same issue. Moreover, the case study design preserves as much as possible the naturalistic conditions of the task. In this study no restriction was made on the number of practice sessions or strategies employed in order to approximate the research task as closely as possible to the musicians' real-life experiences. On one hand, the use of the longitudinal case study method developed by Chaffin and colleagues allows a more direct comparison of the results of the current study with those of previous studies contributing to PC theory. On the other hand, the multiple case design permits a direct replication of the findings for more than one case. It is important to emphasise that each case studied here is considered as a whole study. The examination of each case used a protocol similar to

[14] The publications planned in collaboration with Roger Chaffin and Alexander Demos, will use more advanced statistical models, namely generalised mixed effects models.

that previously employed in research studies on the PC theory. However, a cross-case analysis presented in Chapter 6 considers how information is replicated across the different case studies (Yin, 2014).

The piece selected for the study was *Encore No. 2 (Leaf)* by Luciano Berio. This piece was recommended by one of the professional pianists interviewed in Chapter 3. The music selection followed the criteria of: lack of tonality, indiscernible structure and short duration. The reason for choosing a short musical work (1:30 minutes) is based on practical criteria related to data collection and analysis. First, asking participants to insert a long and complex non-tonal piece into their busy routines was considered to be an impractical requirement. Second, analysing the entire learning process of a long, non-tonal piece of several pianists could become an impossible task within the scope of a PhD project.

The sampling method adopted to recruit participants was *convenience sampling* (Gravetter & Forzano, 2012), mainly because of the aforementioned difficulties in recruiting pianists able and willing to accomplish such a complex task as learning and memorising a non-tonal piece. One limitation of this method is that it is not possible to control the representativeness of the sample to the general population. However, it is important to stress that this thesis is primarily exploratory and the aim at this stage is not to generalise the results, but to explore in detail how musicians memorise non-tonal music in naturalistic settings. Because of the high complexity of the type of repertoire under investigation, only musicians with higher-level expertise were considered for the study. Initially, both postgraduate musicians and professional musicians were recruited. However, none of the professional musicians contacted were available due to professional commitments. Consequently, only postgraduate students agreed to join the study.

In the first stages of research, the invitation to join this study was sent to several postgraduate students. However, the response was very limited, and, from the eleven pianists who initially agreed to contribute, five dropped out in the middle of data collection because they could not cope with such time-consuming task within their busy practice routines. Fortunately, six participants agreed to complete the study.

All of the participants were asked to follow a protocol similar to that of previous longitudinal case studies: video recordings of all practice sessions, concurrent and retrospective comments, annotations in the score and pre- and post-study interviews. One significant difference from previous observational studies is

that no restriction was placed on the strategies employed, including the use of mental rehearsal. Mental practice has often been excluded from previous research, because of the difficulty of measuring such intricate thought processes. However, in the pre-interviews for this study and interviews in Chapter 3, several participants emphasised the importance of mental practice as an aid to learning and memorisation of this type of repertoire. In order to preserve as much as possible the naturalistic conditions of this type of task, engagement with mental practice was allowed under conditions described in Chapter 5 (p. 203).

After all the pianists completed the study, all data from the six case studies were assembled. An exhaustive analysis of the overwhelming amount of data soon revealed this to be impractical within the scope of this thesis. The proposed solution was to reduce the number of cases that would be analysed extensively.[15] Because one of the aims of this thesis is to explore effective memorisation strategies relevant to non-tonal piano repertoire, the accuracy of the memorised performances was used as the criterion to select three case studies for detailed examination (see Subsection 5.2.3 for further detail). A detailed description of the selection criteria and methods employed in this study can be found in Chapter 5 (pp. 198-206).

[15] The analysis of the six case studies will be reported in future publications.

3 MEMORISING CONTEMPORARY MUSIC: PROFESSIONAL PIANISTS' ACCOUNTS

3.1 INTRODUCTION

This chapter explores professional pianists' views towards performing from memory, as well as their approaches to learning music and memorisation, focusing on contemporary piano repertoire.

The virtuosity promoted during the romantic era instigated a tradition among pianists of playing without a score (Ginsborg, 2004; Mishra, 2014). Consequently, audiences have become accustomed to seeing pianists performing complete recitals from memory (Aiello & Williamon, 2002). Nevertheless, such a tradition does not entirely apply to contemporary piano repertoire, as "players are silently excused memorising it since it can be phenomenally difficult to remember accurately" (Hamilton, 2008, p. 80). Even though performing with score has become generally acceptable for this type of repertoire (Mishra, 2014), no one has so far attempted to explore why is this music so particularly difficult to remember. Moreover, this practice does not appear to be completely established among pianists. Some renowned soloists of contemporary works continue performing a wide variety of modern styles of repertoire from memory (e.g., Ermis Theodorakis), while others play everything with the score (e.g., Philip Thomas).

Although existing literature has laid the groundwork for understanding musicians' attitudes and approaches towards performing from memory (Hallam, 1997; Mishra, 2014; Williamon, 1999b), no research to date has investigated pianists' views on memorisation of music written after the end of the 20th century. Moreover, current studies on preparation for memorised performance often neglect non-tonal music. Common insights have emerged from accounts of pedagogues and studies in music psychology, namely the important role of segmenting music for memorisation and the use of different types of memories, such as visual, aural, kinaesthetic or conceptual (Ginsborg, 2004, 2017; Hallam, 1997). Different strategies have also been found across different levels of expertise (Aiello, 1999; Chen, 2015; Hallam, 1997). Nonetheless, the above mentioned studies are focused on general approaches to

learning and memorisation and often focus on tonal repertoire. Chen's (2015) study is an exception, as pianists were directly asked about strategies in different styles of repertoire. Nevertheless, musicians' accounts related to memorisation of contemporary music are usually vague and superficial. Thomas (1999) explored professional pianists' reports about learning approaches in contemporary piano music and identified several issues to be taken into account when performing this repertoire. A case study by Mishra and Fast (2015) also examined practice strategies employed by a professional musician while preparing a commissioned piece for its first performance. Although these studies have provided important insights on how musicians prepare this repertoire for performance, they haven't directly addressed the topic of memorisation. There is still a gap in research exploring how musicians approach more recent styles of repertoire and cope with the demands imposed by this music.

3.2 THE STUDY

3.2.1 Aims

The purpose of this study was to examine pianists' views and experiences of learning and memorising music, focusing on contemporary piano repertoire.[16] The first aim was to explore professional pianists' attitudes on performing from memory and, more particularly, their views on performing contemporary music without score. The second aim was to extend existing insights on how musicians approach learning and memorisation, focusing on repertoire written after the 20th century. The interviews addressed a wide range of modern styles of repertoire, from *minimalism* to *new complexity*.

[16] The term "contemporary piano music" was interpreted by the participants according to their subjective experiences, although in general they tended to associate it with Western music written since 1945.

3.2.2 Participants

Professional pianists with vast experience in performing contemporary piano repertoire were recruited for this study. The selected sample aimed at including pianists who perform a wide range of contemporary piano repertoire from memory and with the score. Moreover, it also included pianist–composers in order to embrace different perspectives regarding this topic. In total, six pianists were selected for this study: Andrew Zolinsky, Andrew Ball, Philip Thomas, Ermis Theodorakis, Christos Triantafillou and Christopher Goddard.

Andrew Zolinsky (AZ)[17] has established himself as a distinctive musician in his generation. In the field of contemporary music, he has performed music by Laurence Crane, Patrick Ozzard-Low, Valentin Silvestrov, Diderik Wagenaar, Michael Finnissy, Michael Zev Gordon, David Lang and Simon Holt. The last four composers have composed and dedicated pieces to him. Zolinsky's recording of Michael Zev Gordon's solo piano music (NMC) was considered by Paul Driver in the *Sunday Times* as one of the "top ten contemporary CDs of 2009". Alongside his career as soloist, he is also a piano professor at Goldsmiths, University of London and at the Royal College of Music (RCM), where he assumes the role of contemporary piano co-ordinator. The interview with Zolinsky took place on the 2nd of July 2015 at the RCM and lasted 1 hour and 15 minutes.

Andrew Ball (AB) is a recognised British pianist and pedagogue. This pianist has created a reputation for his innovative and imaginative repertoire. In the contemporary field, he has worked closely with composers such as Michael Tippett, whose sonatas he has performed as a cycle. Andrew has also performed pieces for prepared piano and some works by Brian Ferneyhough and James Dillon, representative of the *new complexity* style. Ball has premiered several works, including Sofia Gubaidulina's *Piano Sonata*, and has collaborated with several ensembles, including the Nash Ensemble, London Sinfonietta, Villiers Piano Quartet and Gemini. His acclaimed CDs include recordings of Tippett's song cycles, Lili Boulanger's vocal and choral music and Billy Mayerl's work for piano and orchestra. Ball was head of keyboard at the RCM and is currently a piano professor in the

[17] All pianists will be identified by their initials in tables and quotes, which are indicated in this section next to their name.

keyboard faculty. The interview with Andrew Ball took place on the 24th of June 2015 at the RCM and lasted 50 minutes.

Philip Thomas (PT) is a British pianist who has specialised in new and experimental piano repertoire, including notated and improvised music. He has performed music by John Cage, having performed his *Piano Concerto* and most of his solo piano music and music for prepared piano. He is also often associated with Christian Wolff's music, being responsible for the world premiere of *Sailing By* and *Small Preludes* and the UK premiere of *Long Piano*. Thomas has commissioned pieces by several British composers, namely Stephen Chase, Laurence Crane, Richard Emsley, Michael Finissy, Christopher Fox, Bryn Harrison, John Lely, Tim Parkinson, Michael Parsons and James Saunders. He has recorded several CDs, with compositions by Martin Arnold, John Cage, Laurence Crane, Christopher Fox, Jürg Frey, Bryn Harrison, Tim Parkinson, Michael Pisaro, James Saunders, Linda Smith and Christian Wolff. His CD recording *Comprovisation* is representative of his improvisatory side, including commissioned works by Mick Beck, Chris Burn and Simon Fell. The interview with Philip Thomas took place on the 6th of July 2017 in a café in London and lasted 1 hour and 10 minutes.

Ermis Theodorakis (ET) is a Greek pianist who has become well known for his performances from memory of highly complex contemporary works, such as pieces by Iannis Xenakis, Claus-Steffen Mahnkopf or composers from the second Viennese school. He studied piano and composition at the University of Athens and later at the Amsterdam Conservatory, where he studied composition with Mahnkopf. This pianist has dedicated his career to performance of contemporary music. He has premiered works by several living composers and has worked with renowned composers such as Brian Ferneyhough, Mahnkopf, Frank Cox, Xenakis and Mark Andre. Theodorakis has a wide discography of this repertoire, including recordings of the complete piano works by Xenakis, Claus-Steffen Mahnkopf and Yorgo Sicilianos. He has also recorded piano music from the second Viennese school, as well as various Greek composers. This pianist was considered by Xenakis as an ideal interpreter of his works (Dontas, 2004). The interview with Ermis Theodorakis took place on the 13th of January 2017 in his home, in Leipzig, and lasted 2 hours and 30 minutes.

Christos Triantafillou (CT) is also a Greek pianist who has performed, premiered and recorded a wide range of contemporary Greek music from memory, including works by Panayiotis Kokoras, Nikolas Tzortzis, Haris Kittos, Panos

Ghikas, Giannis Kiriakidis and Dimitris Bakas. These composers embrace compositional styles that range from minimalism to new complexity. Triantafillou has performed entire recitals of this repertoire from memory. He studied piano and music theory in Larissa, Greece and then specialised in performance at the National University of Music in Bucharest, Romania. Triantafillou was interviewed for this study on the 28th of June 2017 via Skype, because it was not financially possibile to fly to Greece at the time. After a general interview lasting 1 hour and 30 minutes, Christos still felt that he could provide more detail with specific examples from Greek composers. Therefore, we continued the interview on the 5th of July 2017. The second part of the interview lasted 2 hours and 30 minutes.

Christopher Goddard (CG) is a Canadian pianist and composer. He has performed several contemporary works, premiering various pieces by his colleague composers and collaborating frequently with new music ensembles, such as Ensemble Moto Perpetuo, Columbia Composers, Penn Composers Guild, the Wet Ink Ensemble and others. He has also performed solo piano works from memory by Pierre Boulez and Arnold Schoenberg. The interview with Christopher Goddard took place on the 30th of June 2017 via Skype, because there was no financial possibility of flying to Canada at the time. The interview lasted 1 hour and 20 minutes.

3.2.3 Procedure

Six semi-structured interviews were conducted with the professional pianists above with the intent of providing a comprehensive exploration of their views and experience of performing contemporary piano repertoire. An interview topic guide was created and used for all interviews (see Appendix 1), covering four main domains: (1) attitudes towards performing from memory; (2) experiences of learning, memorising and performing from memory; (3) skills required to perform contemporary music and (4) experiences relevant to the performance of contemporary music, namely collaborations with living composers. The effectiveness of the interview schedule was evaluated through a pilot study with four postgraduate students studying at the Royal College of Music. This study assessed the average time of the interview, as well as the potential of the selected questions to elicit topics of interest and to generate broad and rich answers. The interviews lasted, on average,

between 50 minutes and 4 hours. Interviews were recorded with a digital audio recorder. Each interview was recorded with verbal and written consent from the participants and further transcribed verbatim. Participants were notified when the recording started and made aware they could stop recording at any time. The transcripts were later sent to the pianists to verify content accuracy. During the interview, the main strategy was to ensure that all questions in the schedule were covered, while at the same time encouraging the pianists to expand interesting issues arising during the conversation.

3.2.4 Data Analysis

The interviews were analysed using Interpretative Phenomenological Analysis (IPA). The aim was to provide an in-depth examination of learning and memorisation followed by these six pianists, acknowledging their subjective and individual experience, while at the same time examining convergences and divergences arising from their reports (Smith et al., 2009).

The software NVivo 12 was used to carry out the analysis, while following the protocol recommended by Smith et al. (2009). Three main stages were followed when conducting the analysis: (1) several readings of each individual transcript, while annotating exploratory comments with key aspects found in the data; (2) examination of the exploratory comments and annotation of emerging themes; and (3) grouping of themes into superordinate themes. The superordinated themes were found through *abstraction* (recognition of different patterns among themes); *subsumption* (transformation of a theme into a superordinate category, if it was able to include other themes); and *numeration* (number of times a theme appears in the data) (Smith et al., 2009). Due to the wide scope of the analysis, only themes common to all participants are reported in this chapter (see Table 1, p. 83). IPA analysis prioritises what is said by the participants without any intent to go beyond their subjective perspectives. Therefore, the pianists' quotes are frequently presented alongside the analysis in the following discussions and all transcripts from the interviews are available in Appendix 8.

3.2.5 Ethical Approval

This study followed the British Educational Research Association (BERA) Ethical Guidelines and was reviewed and approved by members of the Conservatoires UK Research Ethics Committee at the Royal College of Music (see Appendix 10.1). Prior to the study, all pianists were provided with written information about the research project, together with a consent form, where they were informed they could withdraw the study at any point. Since the identity of the participants was considered valuable to this study, the consent form also included a request to use their name in further publications.

3.3 RESULTS AND DISCUSSION

In this study, all six pianists provided very rich and detailed descriptions of their views and experiences of learning and memorising contemporary piano repertoire. The IPA analysis (Table 1) found five superordinate themes common to all participants, namely their experiences of performing contemporary music, their choice of playing with or without score, practice and memorisation approaches, and performance experiences. The common superordinate themes will be discussed below.

Table 1. IPA Analysis - Common Superordinate and Subthemes.

Superordinate Theme (Su.T)	*Subtheme (ST)*	*Examples*
Performance of contemporary music	Contemporary specialisms (AB=2; AZ=5; CG=1; CT=1)	"The idea of whether I am a new music pianist, or a traditional repertoire pianist or not is kind of irritating, really" (AZ, p. 390, lines 442-443).
	Contemporary music challenges: • Absence of obvious structures and patterns (AB=2; AZ=3; CG=6; CT=4; ET=4; PT=4) • Problematic writing	"[…] because a lot of the music that I have played doesn't have so many traditional ideas about shape and gesture, phrasing" (PT, p. 460, lines 3404-3405). "But I think there are so many barriers in contemporary piano repertoire to play this music from memory. One is notation. I

	(AB=1; AZ=9; CG=7; CT=1; ET=1) • Takes time (AB=1; AZ=3; CG=4) • Rhythm and tempo (CG=9; CT=4)	think another is just the fear induced by the extreme technical/physical demands of the piano writing, demands that often verge on the impossible" (AZ, p. 392, lines 522-525). "[…] I remember learning the first page of this piece and that would take me about half an afternoon to learn a system [laugh][…]" (CG, pp. 424-425, lines 1910-1911). "I came to notice that the biggest thing for contemporary music was rhythm" (CG, p. 423, lines 1845-1846). "Here is another problem. The composer gives you the basis, the notes, beats, but for the pianist is difficult to improvise the tempo […]" (CT, p. 414, lines 1480-1481).
Performer's attitudes towards contemporary music: • Fear and lack of understanding (AB=1) • Attitudes are changing (AB=1; ET=1; PT=1) • Exposure is important (CG=2; CT=2; ET=2)	"I think there is still a lot of kind of fear and lack of understanding […]" (AB, p. 388, line 379). "Things are certainly better than twenty years ago, but not yet, really. Specially the piano is really a classical instrument. There is a lot of historical repertoire and there are still a lot of teachers and a lot of young people that want to only focus on it and are not at all into contemporary music. If I ever teach again – because I have not taught at all for the last ten years – I would like to try, to do an effort in this way." (ET, p. 451, lines 3047-3051). "Actually I think that contemporary music should be incorporated early. Dimitris Bakas, for example, wrote a piece for children, with extended techniques, and by playing this music, children start familiarising with the contemporary sound and its techniques" (CT, p. 405, lines 1083-1086).

	Collaborations with living composers: • Working with composers (AB=2; AZ=1; CG=1; CT=2; ET=1) • Composer's role in the learning process (AB=6; AZ=2; CG=1; ET=2; PT=4)	"A composer I have in my mind at the moment is a real metronome junky as I call him. He will come to the rehearsal with his metronome, and if you are not absolutely on the nose with the metronome, the metronome goes on and I find that inflexibility a little bit unattractive, I have to say" (AZ, p. 402, lines 943-946). "Of course it gives you a particular edge when you make discussions around these readings [with the composers], but I don't think it made any difference to the way I have prepared it" (AB, p. 387, lines 305-306).
The choice of playing with or without score	Tradition of performing from memory (AB=2; AZ=2; CG=3; CT=1; PT =1)	"I think it was in about 1996/1997, twenty years ago, and I think [I performed from memory] for the reason that it is traditionally done. I am a pianist, I am expected to play things from memory. There is no other reason I can give […]" (PT, p. 469, lines 3812-3814). "Then, also because I was led to do it in the classical world, to learn things by heart" (CT, p. 406, lines 1108-1109).
	Benefits: • Deep knowledge (AZ=3; CG=1; CT=1; ET=1; PT=2) • Freedom (AB=1; AZ=2;CG=1;ET=1) • Improved communication (AB=1; CG=1) • Improved listening (AB=2; CT=1) • Work away from the piano (CT=1; ET=2)	"I think it forces you to really know the music. You really have to know the details" (AZ, p. 393, lines 565-566). "The advantage is some kind of freedom. If you play something from memory, you have absorbed the work in a way and you are really free from technical details, how to turn the pages, or from having a page turner or not" (ET, p. 438, lines 2466-2468). "[…]I think there is nothing like a performance from memory and the communication with the audience for the feel that you are really feeling, that you are really communing with the

		composer" (AB, p. 381, lines 67-69).
		"But I think that one of the biggest differences is that it is easier to listen to yourself when you are not looking at the music […]" (AB, p. 385, lines 223-225).
		"[…] and also because after some time you can work with your inner ear. If you can do this [play from memory] you can see every piece in your head" (CT, p. 406, lines 1113-1115).
	Performance effect (CG=1; CT=1)	"[…] I played some of the *Pierre Lunaire* from memory and that was for a dramatic effect, because there was some staging involved" (CG, p. 421, lines 1750-1752).
	Limitations: • Fear of forgetting (AB=1; AZ=2; PT=3)	"I am sure we all really fear memory loss more than anything else in performance" (AZ, p. 392, lines 544-545).
	• Time and performance constrains (AB=4; AZ=5; CG=1)	"[Why] spending a lot of time memorising if you are going to play them [contemporary pieces] once and people are going to listen to them very occasionally?" (AB, p. 381, lines 53-55).
Practice approaches	Learning stages (AB= 2; AZ=1 CG=6; CT=11; ET=3; PT=12)	"As I say, I am a good sight-reader, so for a little while, in the very beginning of learning something like that I would just sort of feel my way through it […] But then the real work starts and fingering is vital […] Then I would be very rigorous. I would determine I was going to learn 17 bars each day, maybe not a huge number of bars, but I would do it […]" (AB, p. 383, lines 136-146).
	Segmentation strategies (AB=1; CG =4; CT=5; ET=4; PT=2)	"Really tedious. I start from the beginning, I go to the end of the line, I learn the notes. I think about dynamics, I think of timing" (PT, p. 461, lines 3468-3469).

	Goal setting (AB=1; CG=1; CT=1)	"I set one goal every time when I start practising. For example, I say, 'today I will learn this page'. I don't care how many times" (CT, p. 418, lines 1624-1625).
	Score markings and revisions (CT=1; ET=1; PT=2)	"I rewrote this, but not completely, it was only to help me with fingering and deciding which hand is going to play what" (ET, p. 453, lines 3119-3120).
Memorisation approaches	Incidental vs deliberate memorisation (AB=1; AZ=7; CG=6; CT=2)	"I don't do this. Some people have this method where they open the book and play eight bars and play it again and again and they shut the book and then they play and shut the book again and do another eight bars. Frankly, I just can't [laugh]" (AZ, p. 395, lines 646-648).
	Practice away from the piano (AB=3; AZ=1; CT=11; ET=6; PT=4)	"If you are playing from memory, I think is very important to go through the music away from the piano and go through it from memory, but without actually having ones fingers playing the notes. I think that is very important" (AB, pp. 384-385, lines 208-210).
	Chunking	"It is quite easy to find an intervallic structure in the piece Mists, because Xenakis uses his *Principle of Sieves*, if you know about this. It is a method in which he constructs scales, which are not repeated in the octaves and go through the whole range of the instrument" (ET, p. 443, lines 2707-2710).
	Memory types: • Kinaesthetic memory (AB=4; AZ=9; CG=8; CT=7; ET=1) • Structural memory (CG=3; CT=8;ET=11;PT=3) • Visual memory	"It [Boulez's *Second Sonata*] was in my body, it wasn't just in my hands. So, all the sort of coordination of my arms and my shoulders and everything, it wasn't just my one, two, three fingers, but it was as if the entire thing have been mapped into my body" (CG, p. 426, lines 1982-1985). "[…] but you should use

	• Aural memory (AB=1; AZ=1;CT=1; ET=1)	theoretical knowledge, polyphony, harmony, counterpoint, everything you play […] you should also use that knowledge. In that case, in the beginning this is what you pay attention to" (CT, p. 408, lines 1197-1200).
		"[…] and in some cases people have a photographic memory. When I say photographic memory I don't necessarily mean they see exactly what is in front of them, but you have a sense of where something is on the page and somehow that ignites the memory" (AZ, p. 393, lines 587-590).
	Dealing with switches (CG=1; CT=1; ET=3)	"[This part is difficult] because you have kind of harmonic progressions. This means you have repetitions of this one bar [indicated in the score] for more than one page, which are not exactly the same […] This means it is the same motif, the same melody you follow […] but some intervals move from time to time upwards, some downwards and they produce tiny differences. […] the whole process is really difficult to memorise" (ET, p. 446, lines 2840-2846).
Performance experiences	Living the moment (AB=2; AZ=1; ET=1; PT=3)	"I try just living the moment as much as possible" (AB, p. 384, line 174).
	Focus on the sound (CT=2; PT=1)	"[…] I have only the sound, the sound that I want to express at that time with that piece" (CT, p. 410, lines 1286-1287).
	Monitoring the performance (AB=1; AZ=1; CG=1)	"Sometimes, if something is really very difficult from memory, certainly in the first few performances of a piece you might concentrate more fiercely on sequences of harmonies, or certain fingering" (AZ, pp. 396-397, lines 719-721).
	Extraneous thoughts (AB=1; AZ=3; CG=3; ET=1; PT=1)	"Well, if I am really relaxed and I have played the piece more times, then I also try to think

about other things. For instance what I am doing after the concert [laugh]" (ET, p. 450, lines 2990-2991).

3.3.1 Performance of Contemporary Piano Music

Several insights emerged in the interviews in relation to these pianists' experiences of performing contemporary piano music. One topic addressed was the idea of contemporary specialisms, namely the preconceived impression that contemporary music is a specialised field and requires a very specific learning approach. Ball and Zolinsky criticised this principle, as they feel that contemporary music is basically learned in the same way as any other musical style. As pointed out by Ball: "actually anyone can play contemporary music, because it is music, and basically it needs the same qualities of technical expertise and imagination, intellectual control that we would be using in all the other styles" (AB, p. 389, lines 355- 358).

Zolinsky shares the same opinion: "I would like to say there are some magical differences between how one learns contemporary music, or how one learns traditional music. I really don't think there is" (AZ, p. 397, lines 696-698).

Despite arguing that contemporary music is, after all, music, all pianists recognised that this repertoire has particular challenges when compared with earlier music styles. One difficulty is the absence of obvious structures and patterns. Ball noticed that, unlike tonal styles of repertoire, in some contemporary piano repertoire "there is not necessarily any harmony" (AB, p. 385, lines 193). In this case, pianists need to find their way into it. However, particularly when the style is unfamiliar, musicians may not be able to understand how musical elements are organised and the task of memorising can become problematic:

> […] it might take a long time before you could see why the notes there interact with each other. Of course you may never discover that, but if you can't discover that, memorising becomes very difficult and very tedious, because it is like learning something in a language that you don't understand, so you are just learning phonetics without learning the meaning behind the words (AB, p. 387, lines 257-261).

In this statement, Ball associates the inability to use stored knowledge of musical vocabulary when encoding new music to the attempt of learning phonetics without knowing the meaning behind words. This absence of familiar knowledge will, therefore, hinder memorisation. Thomas also pointed out how most of experimental

music he plays "doesn't have so many traditional ideas about shape and gesture, phrasing […]" (PT, p. 461, line 3405). Goddard mentioned the same issue, emphasising that this music not only removes standard principles found in tonal music, but also violently confronts them. When talking about his experiences of memorising Boulez's *Piano Sonata No. 2*, he noted:

> […] it is very striving, it is very sort of disjointed melodically. There are a lot of huge leaps all over the piano and this is all coincidental. This is all sort of against the pianisms of prior music with proximal finger work, such as scales, simple arpeggios. So, it not only doesn't do that, I think that violently confronts those things (CG, p. 425, lines 1893-1897).

Theodorakis shared a similar feeling when describing his experience of memorising the opening of *Eonta,* by Xenakis. He noticed how the opening of the piece is random and how he had to invent his own logic for the music: "[It contains] a lot of leaps and the pitches are, for the first forty measures, really random. So there is really no logic behind the sensations, the pitches. Then you have to invent a logic in this case" (ET, p. 440, lines 2528-2530).

Almost all pianists mentioned how writing in contemporary music is problematic. Zolinsky highlighted that some pieces are not particularly well written for the piano, because they do not lie under the hand brilliantly, affecting the development of "physical" memory:

> I think one has to accept that a lot of contemporary piano music, even though it sounds wonderful and that is why we play it, it is not particularly well written for the piano. It doesn't really lie under the hand particularly brilliantly. I am not saying the majority, but a lot doesn't in the same way as playing, you know, Chopin's *Sonata No. 3* does. And so, therefore, it's extremely hard to create the sense of physical memory about it (AZ, p. 399, lines 775-779).

Goddard also mentioned this point in relation to Boulez's writing, stating that "he writes all these things that are sort of impractical and there are always weird polyphonic streams that don't seem to match when your hands are playing […]" (CG, p. 426, lines 1915-1917). The impracticalities present in this music are, for Triantafillou, an effect of the existing separation between pianists and composers:

> One problem of our times is that we have composers and pianists. This is very bad for us. Currently pianists don't have the time or need to train in composition and composers don't have the time or need to train an instrument. This is a very important issue. For example, the last pianist–composers who played their own works were the Russians. For examples Stravinsky, Prokofiev, Scriabin. The new composers after Xenakis, after Stravinsky in general, don't play their works. And this is one problem. It doesn't matter what you can do in your mind if you can't apply it in practice (CT, p. 408, lines 1160-1167).

On one hand, pianists have more difficulty in understanding the composer's language, because they do not compose. On the other hand, composers write impractical music, because they don't experiment with their works on the instrument.

Ball, Zolinsky and Goddard also talked about the time they have to spend learning this repertoire. Goddard remembered, almost with embarrassment, how much time he spent learning just the first page of Boulez's *Sonata No. 2*:

> […] I remember learning the first page of this piece and that would take me about half an afternoon to learn a system [laugh]. It is almost embarrassing to say that now, because I think I would do a little bit better now. But at the time, it took an enormous amount of time just to figure out how the things lined up, and just to sort of get into my fingers, how these gestures worked, and how the fingering worked (CG, p. 424-425, lines 1910-1915).

For Zolinsky, it is not only a question of absorbing and digesting all these details, but also of presenting "the results in an emotional sort of meaningful way" (AZ, p. 400, line 836).

Finally, Goddard and Triantafillou also pointed out difficulties related to rhythm and tempo. Goddard noticed how frustrating it becomes learning music with no time signatures "because you don't have this signposting guide, to guide your thinking […]" (CG, p. 425, lines 1878-1879). Besides rhythmic issues, Theodorakis and Triantafillou also emphasised the importance of learning how to deal with the recurrent changes of tempo in this music:

> In contemporary music, one very big and important issue related to this is tempo. For example, you should take the metronome alone and feel the different tempos, 120, and feel the beat [sang the rhythm]. Then 56 is this, then 31 is this, ok? This way you can feel the tempo inside you, and you should become yourself a metronome when you deal with contemporary music (CT, pp. 413-414, lines 1400-1404).

Pianists dedicating themselves to this type of repertoire have to cope with the numerous difficulties described above. The musicians in this study noticed that some skills are particularly useful when tackling these challenges. Ball, Goddard and Thomas identified good sight-reading as an important skill. Goddard actually pointed out how helpful it was to be good sight-reader when approaching this repertoire: "I am lucky, I am a pretty good sight-reader and that has helped me a lot. I think that a lot of contemporary musicians tend to be good sight-readers, just out of necessity […]" (CG, p. 430, lines 2115-2117).

Goddard also noticed that, when approaching contemporary piano music, "the most important skill is curiosity" (CG, p. 434, line 2277). Thomas shared a similar view, explaining that what has led him towards experimental music was actually curiosity for the work of specific composers.

The pianists in this study spoke not only about their experiences of performing contemporary repertoire, but also touched upon attitudes and responses of other performers to this music. Ball mentioned that there is still fear and lack of understanding among performers:

> I think there is still a lot of kind of fear and lack of understanding. I was Head of Keyboard here [RCM] for six years and I did quite a lot to introduce new music here. And, my experience with the teachers, with the professorial staff was that everyone was in favour of it. There wasn't a single person who was against it, but they didn't necessarily played it, they didn't necessarily know how to teach it and they didn't necessarily know which pieces from the repertoire were good to play and which pieces weren't, so I think there is a lot of education to be done there. Taking away people's fear and ignorance is important (AB, pp. 388-389, lines 379-386).

Goddard, Theodorakis and Triantafillou pointed out that pianists are not exposed enough to contemporary music during their training. Although things are changing, it is still not enough. For example, as noticed by Theodorakis:

> Things are certainly better than twenty years ago, but not yet, really. Specially the piano is really a classical instrument. There is a lot of historical repertoire and there are still a lot of teachers and a lot of young people that want to only focus on it and are not at all into contemporary music. If I ever teach again – because I have not taught at all for the last ten years – I would like to try, to do an effort in this way (ET, p. 452, lines 3047-3051).

Finally, still on the topic of performing contemporary music, all of the pianists mentioned that contact and collaboration with living composers is a very special situation that performers get to experience when performing new music. Ball believes that "all pianists should work with the composer at some point […]" (AB, p. 390, lines 396-397). All pianists in this study stated that working with living composers does not affect their learning approach very strongly, but can provide important insights in relation to music interpretation. Theodorakis believes that it depends on the composer and on what they actually say:

> It depends on what they have to say. It is really very different. There are composers that speak much more about their theories and concepts of the piece and things that don't really have any influence on the way the piece should be played. Perhaps on the way the piece should be understood and then it might influence my perspective. On the other hand, there are composers that have composed the piece on the instrument, perhaps they are able to play themselves the piece and then they have a very concrete

> picture of what they want to hear and they want to have this reproduced. I think this can be problematic, but, of course it is their piece, if they want to hear it in this specific way, this is what they get (ET, p. 454, lines 3136-3144).

Ball also argues that "all pianists should compose at some point, just to experience the difficulties of actually putting notes down on paper" (AB, p. 390, lines 397-398). Theodorakis and Goddard are both composers and they agree that having this experience actually helps acquire deeper understanding of the process and of music language.

All pianists in this study provided detailed descriptions of their relationships with living composers and mentioned more relaxed and tense experiences, depending on the composer's goals and personality. Since this topic is beyond the scope of this thesis, it will not be explored further. Detailed experiences can be found in Appendix 8.

3.3.2 The Choice of Playing With or Without the Score

One topic emerging from all interviews was the choice of playing with or without the score. Theodorakis and Triantafillou usually play from memory, including different styles of contemporary piano repertoire. Goddard plans to memorise some contemporary pieces, but others he actually memorises without any deliberate intention. Zolinsky sets out to memorise as much as possible, but he plays some contemporary works with the score, not only because of the challenges mentioned above, but for other factors that will be discussed below. Ball used to play standard pieces of piano repertoire from memory, but most contemporary pieces he performs with the score. Finally, Thomas nowadays performs his entire repertoire with the music.

While talking about their choices of using or not score on stage, most pianists mentioned the tradition of performing from memory and how nowadays audiences just expect pianists to perform without score. Thomas mentioned that the last piece he had memorised was Berio's *Sequenza 4* and the reason for playing by heart was exactly because this is how it is traditionally done:

> I think it was in about 1996/1997, twenty years ago, and I think [I played from memory] for the reason that it is traditionally done. I am a pianist, I am expected to play things from memory. There is no other reason I can give. I can't think of any good

> reasons now, why should I have done it from memory. I wouldn't do it now (PT, p. 469, lines 3812-3815).

The idea that pianists are expected to play from memory was confirmed by Zolinsky. When asked how he decides to play from memory or with the score he answered: "Certainly, in traditional repertoire there is an expectation […]" (AZ, p. 393, line 539). Triantafillou also admitted that initially he "was led to do it in this classical world", although personally he "never felt forced to do it", as he plays by heart because he likes to memorise (CT, p. 407, 1108-1109). Christopher Goddard mentioned this issue as well, and how pianists just assume that more classical styles of repertoire should be played by heart.

Pianists such as Zolinsky or Ball talked about how they disapprove of these conventions. Zolinksy mentioned: "the whole sort of convention of playing from memory drives me mad really" (AZ, p. 393, line 543-544). Ball also reflected about how these traditions are just crazy. In the end, what should matter is what produces the best performance:

> After all is crazy the whole tradition of playing from memory. Imagine sort of explaining to a Martian, from out of space [laugh], 'well, piano solo, piano concertos you must play from memory, violinists must play concertos from memory, but sonatas from the music, violin sonata. If the violinists plays from memory, the pianists should play from memory as well. Wind instruments don't tend to play from memory at all'. […] Just do whatever is going to produce the best performances (AB, p. 382, lines 72-78).

Nevertheless, both pianists admit feeling inclined to prefer memorised performances with more standard repertoire. Ball noticed that "playing something like the Tchaikovsky concerto does somehow feel very strange to play with the music" (AB, p. 382, lines 47-48). Zolinsky, in turn, mentioned that when he listens to performances with the score something doesn't feel quite connected:

> I think that, having said that, there are pianists on the circuit, very successful pianists, who would play actually everything from the score, and I don't think there is anything wrong with that. I would admit, when I go and watch them play that there is something that doesn't quite feel as connected, and I hate myself for saying that [laugh] (AZ, p. 393, lines 539-543).

Despite the existing conventions of performing from memory, most pianists emphasized the benefits of memorising music. They noted that the act of memorising results in deep knowledge of the piece. Theodorakis noticed how "you are more acquainted with the work" (ET, p. 439, lines 2467-2468). This was actually the first

point mentioned by Zolinsky when examining the benefits of playing from memory: "I think it forces you to really know the music. You really have to know the details" (AZ, p. 393, line 565).

As stated above, Thomas always plays from the score, but he also recognised that memorisation helps to really know the music:

> I think whenever you play any piece, the ideal situation is that you have memorised it, you jave internalised it, that you know what is happening next, that you know the structure, you know the notes, you know where you are going, you know the lay of the land and so when I play with the music in front of me, it's hopefully not because I don't know the music. You have to know the music, of course (PT, p. 457, lines 3235-3239).

Although Thomas recognises the importance of knowing the music deeply either playing with or without score, he doesn't think that permanent knowledge of the music should the ultimate goal, particularly in the case of experimental repertoire. Thomas argues that pianists shouldn't work towards only one version of the music. Having the score on stage can actually raise the likelihood of alertness to spontaneous ideas that might arise during performance:

> […] I think music is always unknowable. There is always more, and you can't ever know it. And I wouldn't ever want to. If I get to the point to which I think that I know something, there is something going on, because I am not thinking about it, I am not inquiring. But I think everyone would agree with that, even if we both would be contentious about that. And everyone knows that. When you give a performance on a night, you are only given a version of the piece. I think that the difference is probably that, in some cases, particularly in more conventional music, and also by that I mean conventional contemporary music, you develop a sense that you are still working towards your own statement in this music, you are still working towards a version of the music that you built confidently, that you are able to project in the performance. But that is partly true. It is also true that I quite like the performance moments that suggest me this, so that I haven't got it all figured out. I want to be alert to something that might occur to me at the moment, and that might come through the notation. It might come through other means, just the response to my touch, to the piano, the acoustics, the audience, what I ate that day, any number of things. But it my also come through the notation (PT, p. 457, lines 3254-3269).

Besides a deep knowledge of the music, pianists such as Ball and Triantafillou also mentioned that memorising improves pianist's listening abilities. Ball noticed that "one of the biggest differences is that it is easier to listen to yourself when you are not looking at the music" (AB, p. 386, lines 223-225).

Another benefit pointed out by most pianists was freedom. Ball, Zolinsky, Theodorakis and Goddard mentioned feeling freer, more liberated. Zolinsky noted that this is particularly the case for virtuoso music, when "you have to really look at

what your hands are doing" (AZ, p. 394, line 568). Ball also acknowledged that playing from memory frees him from "worrying about having a page turner" (AB, p. 383, line 83). Triantafillou, in turn, stated that playing from memory allows greater focus on dimensions other than notes:

> I think it's necessary in this type of music to know the notes by heart, because you need to focus totally on other things rather than notes. For example, in the piece by Haris [Kittos], you need to focus on the sound and movement clusters, in the Dimitris [Bakas] you must have in your mind the sound from the first measure to the last (CT, p. 418, lines 1609-1613).

Other pianists also mentioned improved communication and expressivity. Ball stated that there is nothing like a performance from memory in this sense: "[…] I think there is nothing like a performance from memory and the communication with the audience for the feel that you are really feeling, that you are really communing with the composer" (AB, p. 381, lines 67-69). Goddard actually identified this benefit as a reason for playing Schoenberg's Op. 23 from memory, because he saw expressiveness in the music and wanted to convey this during the performance:

> So, for the Schoenberg, of course, this is one sort of piece that can be approached as a proto-serial piece, especially the *Waltz*, of course. But is also very expressive and it is very much into sort of Brahmsian, *Klavierstück* tradition, so you can approach from either side. I have chose to approach from the more expressive, dramatic world, and for that I thought that to do it from memory would have been a means of liberating myself from the very precise details and open myself to be expressive with the piece (CG, p. 423, lines 1806-1812).

Triantafillou and Theodorakis also saw practical benefits in memorising, such as working with the music away from the piano. Theodorakis noticed that, during his student years, time to practice was very short. For this reason, the best solution was to take the music with him in his mind:

> I wanted to be effective with my time, so the best way to work music in my mind was to take it with me, in my mind. So, I tried to imagine how it is playing the piano without a piano and without score, and this implies memorising (ET, p. 438, lines 2457-2460).

Finally, Goddard and Triantafillou also indicated a very specific reason for performing contemporary piano repertoire without score, related to the desired performance effect. Goddard, for example, mentioned that he played *Pierre Lunaire* by Schoenberg from memory "for a dramatic effect, because there was some staging involved" (CG, p. 422, lines 1750-1751). Triantafillou also performed a recital at Goldsmith's University of London, covering a wide range of contemporary styles,

deciding to perform with the lights out: "After experimenting all types of options I felt that the most suitable option was to play with the lights out, fully" (CG, p. 406, lines 1076-1077). Therefore, it was not possible to see the score in this dark setting.

Although these pianists clearly see beneficial reasons for performing from memory, some also identified limitations. Thomas mentioned the extra anxiety caused by the fear of memory loss: "I do remember, in those times when I did memorise things, finding the extra layer of nerves of just thinking, what if I forget? That itself being unhelpful and so, I tended not to do it" (PT, p. 457, lines 3239-3241). Zolinsky also recognised that memory loss dominates pianists' fear: "I am sure we all really fear memory loss more than anything else in performance" (AZ, p. 392, lines 544-545). For this reason, Ball believes that having the score on stage can actually be a freeing element, taking the pressure of this extra layer of nervousness caused by memorisation:

> […] sometimes there could be a freedom in playing with the music. Sometimes taking the pressure of the memory can disinhibit too, release new sorts of freedom, creativity and I think everyone suffers from some sort of nervousness about memorising, even the greatest musicians (AB, p. 386, lines 230-233).

Ball, Zolinsky and Goddard noticed that memorisation takes extra time, particularly in contemporary piano repertoire. Ball recognised that, because he is a quick learner, playing some contemporary pieces from memory would have actually been a luxury, because he would have to spend much more time on them and he just doesn't see the point in doing it:

> But, as I say, learning a lot of out of the way music quite quickly, it would have been a luxury to play it from memory. If I do play those things from memory it would have take a lot longer and I would probably get bored [laugh]. I would never say that of something like Beethoven's last sonatas, but for example Max Bruch's piano pieces, which are interesting, but minor romantic music, what is the point, really? (AB, p. 382, lines 48-53).

Ball also emphasised that, in contemporary pieces, this extra time is just not worth the effort, because "people are going to listen to them very occasionally" (AB, p. 382, line 54-55). Zolinsky mentioned the same issue. He actually told a story about his performance of Unsuk Chin's *Piano Concerto,* mentioning that the composer persuaded him to perform without the score because the violinist and cellist who had premiered the other concerts were performing from memory. Despite the composer's proposal, Zolinsky still decided to play with the score. One of the reasons for not

going through the extra time of memorising was exactly because he knew that the concerto would have a very limited number of performances:

> The thing is, the piano concerto struggles to get performances because it is probably harder for the orchestra than the other two [cello and violin concertos] and so, therefore, Alban and Viviane have played their respective concertos so many times and so they have now come to a point in the last two, three years, where they felt 'ok, I have played this twenty times, I can do it from memory' (AZ, p. 393, lines 508-513).

3.3.3 Practice Approaches

The pianists provided very rich and detailed descriptions of how they practice contemporary piano repertoire, with specific music examples representing different styles of contemporary piano repertoire.

One topic addressed was the stages they go through when learning contemporary works. All pianist spoke about the importance of identifying the task's demands before approaching detailed work. The majority reported beginning with a preview of the music. Theodorakis noticed how he starts by understanding the features of contemporary works and its methods of composition:

> First I have to see what the piece is about and with this I mean not in a poetical sense, such as describing the nature or feelings. I try much more to see how the form works, what parts it has and also the composition methods; for instance if it is really twelve tone music or if there are any special chords or intervallic formations (ET, p. 440, lines 2513-2516).

This pianist has played a wide range of contemporary styles throughout his career and has found a varied nature in the pieces he has learned over the years. Consequently, his first step is to understand the essence of the music and adapt the subsequent procedure to its specific features. Ball also starts by feeling his way through the piece. When learning Tippett's *Sonata No. 3*, he started by sight-reading, even if inaccurately, just to get a feeling of it:

> As I say, I am a good sight-reader, so for a little while, in the very beginning of learning something like that [Tippett's *Sonata No. 3*], I would just sort of feel my way through it. I mean, it's a very hard piece and it's really impossible to sight-read, but however inaccurately I found it useful just a few times to kind of try and feel my way through it, feel it almost with my arms rather than my fingers (AB, p. 383, lines 136-141).

Thomas and Triantafillou usually preview the work with a notational overview, analysing the score visually (Mishra, 2005). Similarly to the pianists above, Thomas

also believes that the first step is to understand what he is dealing with to figure out how he will approach the task:

> I will make sure I will have understood, it's much more important to know what my approach is going to be, what do I know about the composer, what do I know about their aesthetic, what kind of touch might I use, what am I going to be listening to, how is it going to affect the way I play, when I play, how I play. So all of that is done away from the piano. There is no need for me to play it (PT, p. 459, lines 3344-3349).

All these musicians shared the idea that approaching a complex task requires prior identification of the general principles involved and type of language. The approach of understanding the *big picture* or *artistic image* of the piece has been commonly reported in literature on expert problem-solving strategies (Chaffin et al., 2003). Nevertheless, in previous studies this big picture is often associated with the overall structure of the music. In contemporary music, Triantafillou sees this overall shape as *music geometry*:

> Because one thing that attracts me in contemporary music is geometry. And these composers have in their pieces total geometry. So first of all, I need to see this scheme. I don't care what the notes are, but I try to see one scheme in general, just superficially (CT, p. 407, lines 1132-1135).

This pianist spoke numerous times about *total geometry* throughout the interview. Total geometry is, for Triantafillou, not only how the composer's intention is exposed and organised in the music, but also how the performer interpret those ideas and "translates in practical ways, by performing it" (CT, p. 412, lines 1350-1351). Therefore, more than the conceptual image of musical shape, this pianist thinks about how the piece will be embodied, i.e., about the set of movements that will represent his own interpretation of the music. He mentioned how this is particularly true of music that uses extended techniques, as it requires several movements between the keyboard and the soundboard. Moreover, total geometry in contemporary music also involves elements such as the rhythmic framework or the resulting sound. Triantafillou believes that it is important to think about sound before approaching detailed work, because this is what will distinguish one piece from another. When talking about how he approaches pieces by different composers within the style of new complexity he pointed out:

> First of all we have the sound, because if I don't have the sound, the three kind of complexities will sound the same. It doesn't matter if they have totally different sound or feeling or philosophical ideas. Everything is in the sound (CT, p. 410, lines 1265-1268).

Nowadays, Thomas actually disrupts completely the concept of big picture, at least in relation to the type of experimental repertoire he is dedicated to. He believes that this is a big contrast when compared to traditional performance practices:

> Most of the music I play is often focused on non-continuity, disruption, fraction, and maybe similarity where phrases are non-sensible. To that end, I focus upon the job that needs to be done. I focus upon attack and the quality of my touch, each moment rather than the connection of moments. I think that it is something that has changed a lot for me over the last fifteen years. Well, you know, I was used to come up with an interpretation. Now I just don't do that anymore. Occasionally, I find myself playing the music and focus on what needs to be done and it shocks me, because I have to recall a practice that I used to be involved with fifteen, twenty years ago and it feels fundamentally different from most of what I do now. Again, Christopher Fox, the piece *L'ascenseur*. This piece starts in the bottom of the piano, another 15 minutes, and ends up at the top. It has lots of rhythmic patterns, that just rise. That is one phrase. The piece goes from bottom to top. I am not thinking about trying to make it into phrases. When we try to make something into phrases, what we are trying to do very often is making it familiar. We are trying to make something that is unfamiliar into something that is familiar. But I don't want it to be familiar [laugh]. As soon as I bring phrasing into it I am probably turning the music into something that is always appropriate and this is not how I play it. And I am not saying that this is an entirely valid approach to music, but is not particularly what interests me anyway (PT, p. 461, lines 3413-3431).

This pianist insisted several times that musicians often feel this need to find a sense of shape in music and turn it into something "familiar". Even though this is true for traditional performance practices, he believes that in experimental repertoire this is not always the case and, therefore, avoids following a structural route.

Coming back to how these pianists approach learning the music after understanding the task's demands, most pianists reported engaging in detailed work until everything can be united as a whole for the final performance. Theodorakis attempts to hold on to the image formed during the preview to guide practice, even though he is always refining it as learning progresses: "I try to imagine the final result from the beginning and then do it. But, of course, during the process of learning a piece, this gets always refined" (ET, p. 441, lines 2576-2578). Triantafillou corroborates this idea and also highlights that, even though he works in depth on separate parts, one "should think about that in the end as one unit" (CT, p. 408, lines 1181-1182). As stated above, Thomas doesn't share the same practice in relation to experimental repertoire and therefore does not focus on finding a unified whole for this music, just focusing "upon the job that needs to be done" (PT, p. 461, line 3415).

3.3.3.1 Segmentation strategies

When detailed work begins, all of the pianists reported following a segmented or part approach (Hallam, 1997; Mishra, 2005). When describing the criteria used to segment the piece for practice, most pianists reported relying on the score layout to divide segments. For example, while learning Boulez's *Sonata No 2*, Goddard started by dividing the piece into systems, while he was figuring out how to subdivide the music later on: "In terms of process, I literally took each system at a time, and I thought about how I was going to subdivide it" (CG, p. 425, lines 1890-1891). Thomas noted how he went through a very tedious process of approaching one line at a time while learning Cage's *Piano Concerto:* "Really tedious. I start from the beginning, I go to the end of the line, I learn the notes, I think about dynamics, I think of timing. If I can't play in time I just start slower and build up" (PT, p. 461, lines 3468-3470). Theodorakis also mentioned dividing Frank Cox's *Etude No. 1* into pages, because there were no clear closing points in the music:

> In this case yes, because it is kind of a developing process. You can see that the Etude has nine pages. There is no cut, there are no new ideas coming in. It is always about the same ideas developing and getting bigger. Also, the speeds are getting more versatile. That means, if this is the main beat [sang] then you have slower and quicker speeds within the time; so this is the simplest deviation and these are bigger deviations [showed on the score] (ET, p. 451, lines 2979-2984).

Some pianists, such as Thomas and Theodorakis, also reported singling out complicated passages. When talking about how he approached Cage's *Piano Concerto,* Thomas noted: "For instance, this piece has three really difficult pages. So, I just practise those pages over and over again and I will do it slowly. And then I will take a deep breath and go forward [laugh]" (PT, p. 462, lines 3478-3480).

One common insight stressed by most of the pianists was the importance of processing all musical elements simultaneously. Triantafillou emphasised this point several times throughout the interview, highlighting that you cannot separate learning by starting with the notes and rhythms and then learn the other elements afterwards:

> […] you have to learn all these indications, you don't just start with the notes or rhythms and then the rest. No! You need to follow everything he writes, the *senza pedal*, *una corda*, *tre corde* and so on. For example, when you learn one meter you learn with everything in. Not separate. And here is when the geometry comes in. For example, this beat here, you learn it with all the indications, up and down. Maybe this seems that this is taking your time, but actually you are accelerating the process, because your mind memorises everything (CT, p. 414, lines 1429-1436).

Zolinsky also highlighted this issue and argued that "it is really important to put everything in right at the beginning of the process". He believes that this approach will ensure a proper and effective development of physical memory because we are "loading the right information, we are creating the right habits" (AZ, p. 395, line 612-616).

3.3.3.2 Goal setting

More than just using a segmented approach and incorporating every detail when processing the music, several pianists underlined the importance of setting goals for each practice session and focus on accomplishing those goals. As pointed out by Triantafillou, it doesn't matter how many times or how long you practice as long as you do it: "I set one goal every time when I start practising. For example, I say 'today I will learn this page'. I don't care how many times (p. 418, lines 1622-1623)". Ball also mentioned the use of goal setting in relation to memorisation of Tippett's *Sonata No. 3*:

> Then I would be very rigorous, I would determine I was going to learn 17 bars each day, maybe not a huge number of bars, but I would do it, I would made myself do it, I would made myself memorise it even if I was still playing at half past midnight, so that I knew that I was building it up within a time frame. I am personally much better working like that if I know that I have got a month or six weeks to learn something and I could divide it up and, somehow, I am going to do it. (AB, p. 384, 145-150).

3.3.3.3 Score Markings and Revisions

Besides general practice strategies, these pianists also spoke about very specific techniques used when approaching contemporary piano repertoire. Theodorakis and Thomas mentioned rewriting the original score when faced with problematic notation or when the performer needs to make personal decisions (e.g., with improvised music). Theodorakis, for example, rewrote parts of Frank Cox's *Etude No. 4* to help him figure out practical issues, such as fingering:

> I rewrote this, but not completely, it was only to help me with fingering and deciding which hand is going to play what. And then I worked with both kinds of scores, simultaneously, because what I notate here is still pretty rough. It does not include the exact pulses, any articulation, or the exact dynamics. So, for instance, this is page 14, only this line. And this would be page 14 originally notated. For this extreme degree of complexity it is helpful (ET, p. 454, lines 3118-3123).

This pianist only rewrote parts where he felt that notation should be revised to solve specific practicalities and, therefore, continued using the original score to look for other details. Thomas also mentioned rewriting scores, particularly the ones where he improvises and gives something to the compositional process.

Besides writing new versions, several pianists also mentioned adding markings to the score to help them see logic in the music. Triantafillou, for example, always starts by writing the rhythmic framework of the piece, identifying where the rhythmic groupings fit within the general pulse. The pianist reported using this strategy in every contemporary piece he learns, preparing the score for practice in the first stages of learning by marking the rhythmic structure. Theodorakis also mentioned the importance of finding this rhythmic framework and of understanding how complex rhythms fit within the final tempo. Both pianists emphasised the idea that, even in the most complex music, if you can find a general framework to hold on to, you can do it, because the rhythms are actually very cleverly written. Nevertheless, it is important to spend some time in the beginning figuring out these complexities.

3.3.4 Memorisation Approaches

Besides general practice strategies, the pianists in this study also provided very specific examples of how they memorise.

3.3.4.1 Incidental vs Deliberate Memorisation

Ball reported using a deliberate approach when memorising Tippett's *Sonata No. 3*, as he would just select a specific part of the piece and make himself memorise it, even if he was "playing at half past midnight" (AB, p. 384, line 147-148). Triantafillou also notice that he memorises while "learning the notes and gestures" (CT, p. 409, line 1229). Zolinsky, in turn, believes that the ideal approach is to let memorisation take its course and develop naturally:

> I don't do this. Some people have this method where they open the book and play eight bars and play it again and again and again and they shut the book and then they play and shut the book again and do another eight bars. Frankly I just can't [laugh]. I really don't see a sense in that. I just feel you have to allow things, if possible, to take the natural course. . There is a moment when you realise 'ok, I feel quite secure with this'. By that I don't mean one can just kind of sit back and let it happen at some point in the year, but, you know I am pushing myself the whole time, I am pushing my students to

> get to that point, so you can't keep things too sort of slow for too long and there comes a point where you have to open the cage door and let the bird fly away as it were and just take the chance of how it's going to be (AZ, p. 395, lines 646-655).

Goddard also agrees with this perspective, arguing that the ideal way is "to learn the music and to really have it physically in your body and then to think of how the piece works together as a totality. Only then memorisation can be really valuable and be of any service […]" (CG, p. 434, lines 2257-2259).

Nevertheless, both Zolinsky and Goddard agree that the use of incidental memorisation depends on the task demands and constraints. For example, Zolinsky admitted memorising deliberately when time is short, although he notices that these rushed approaches result in poor long-term recall, as "two months later they are just gone" (AZ, p. 396, line 658). Goddard also mentioned that he has adopted distinct approaches to memorisation in different pieces. For example, in Schoenberg Op. 23, memorisation was on his mind from the start, because he had a specific goal for the performance and had decided to play by heart. However, when he learned Boulez's *Sonata No. 2*, it never crossed his mind to memorise the piece:

> The Boulez, I did not set out to memorise by any means. That piece was something that I learned, I didn't have any experience and it was by far the most complex piece that I have ever played. So, I set out just to learn it. And even to learn, I set out just to learn one movement and see how it came and eventually the movements became together. But I spent so much time with the piece that eventually I just had it memorised. So, I just sort of woke up one day and I thought, I don't even need the score for this anymore (CG, p. 423, lines 1821-1827).

The time spent learning this sonata (almost three years) led to the natural and unintended development of memorisation. Goddard played this very complex piece by heart because one day he woke up and he had it memorised. Zolinsky also told a similar story about a friend who was learning one piece by Xenakis and all of the sudden could play from memory without even realising it. This pianist believes that, even in contemporary music, "when you have been living with a piece for a long time and you really go it into some sort of physical memory, then probably it is possible to do it" (AZ, p. 399, lines 783-785).

3.3.4.2 Practice Away from the Piano

Almost all the pianists in this study highlighted the importance of practising away form the piano as a complement to memorisation. Ball, for example, stressed that "if you are playing from memory, I think is very important to go through the music away from the piano and go through it from memory, but without actually having one's fingers playing the notes" (AB, p. 384, lines 208-210).

Zolinsky also emphasized the importance of this practice for memorisation. He believes that this is a very strong strategy. Because one is not distracted by technical difficulties, music can be seen from a completely different perspective: "It is a really strong form of memory actually, because you are not distracted by technical difficulties or actually putting the right notes down. You are just purely seeing it, as I would see it when I teach somebody […]" (AZ, p. 397, lines 689-692).

Some pianists stressed the importance of musical analysis as a vital tool for memorisation. Ball mentioned *harmonic analysis* in relation to tonal music, although he believes that musical analysis should be what makes sense to the performer. He highlighted this point particularly when asked how he analyses contemporary pieces:

> It depends on the piece. You have to find a way into it […]So, it doesn't have to be a specific sort of analysis and in a way it doesn't even have to be something that the composers intends, but if it makes sense to you then it will help. But I use analysis in the broadest sense. I am not talking about Schenkerian analysis, although it could be. I have said to students before, if they are argumentative, if they say, "I don't see any mean for analyse this and I want to play how I feel the music" I always say, "but when you play it that is an analysis. Performing a piece is a sort of analysis, you can't stay neutral. You are analysing it by playing it, so, you might as well do a good job with your analysis and be conscious of it." (AB, p. 387, lines 256-269).

Triantafillou and Theodorakis also reported analysing the score to understand and work out the complexities of each piece. For example, Theodorakis mentioned working out complex rhythms "on the table", because "only practising the pitches does not help" (ET, p. 443, lines 2662-2663). These two pianists both mentioned imagining the sound of the music and their movements.

Although not in relation to memorisation, Thomas also reported using physical practice to learn the notes and to think conceptually about the music away from the piano:

> But a lot of the time I think of music away from the instrument, so Michael Finnissy's scores, for example, by the time I am at the piano I look at really just physically learning the notes and playing it and getting my fingers in place, but away from that I

> am always thinking about it, thinking about what the music is suggesting (PT, p. 463, lines 3495-3498).

3.3.4.3 Chunking

Goddard, Triantafillou and Theodorakis mentioned relying on musical patterns during their memorisation process. Goddard referred this strategy in relation to tonal music, but the other two pianists were specifically talking about non-tonal music. In the piece *God Good Luck*, by Kyriakides, Triantafillou noticed that some groups of notes form very specific patterns, which are "easier for the hand to remember" (CT, p. 418, line 1577). In this case, patterns are not conceptual groupings, as in tonal music, but hand shapes. The strategy of grouping notes into hand-shape chunks is known as *blocking* and has been found to be a useful technique for memorisation (Nellons, 1974).

Theodorakis also mentioned the chunking strategy several times during the interview. He believes that even in contemporary non-tonal music it is always possible to find ways to organise pitches, and stressed how essential this practice is for memorisation: "even if I have to memorise the absolute chaos, then I try to put the pitches together in these kinds of models" (ET, p. 440, lines 2543-2544). This pianist spent a long time in the interview explaining the models he uses to organise pitches. He noted that the application of organisational models is more intuitive in tonal music:

> For everybody who plays tonal music this [played C Major chord] is a recognizable entity, so there is a major and a minor third or inverted [played C minor chord] or even this [played several examples of seventh chords] or even more complex things, with augmented or diminished intervals. Well, but if you know some Webern [played examples of chords], so major third plus semitone, is also something recognisable […] (ET, p. 440, lines 2537-2542).

Thedorakis believes that when one gets to know specific contemporary composers, it is possible to start recognising specific models or entities. He is also a composer, and consequently he is "actively involved in such questions or problems, how to organise pitches" (ET, p. 440, lines 2519-2520). Therefore, he always finds a way to recognise logical principles in every piece he plays. Of course those principles will depend on the composition. For example, if the music still has some recognisable tonal patterns, Theodorakis associates those entities to the new information. For example, he noticed how one can identify resemblances to minor chords or augmented chords in the

opening of Alban Berg's sonata. Even if the patterns are not exactly tonal, "in principle there are still recognisable, almost tonal elements, extended" in this music (ET, p. 445, lines 2750-2751).

When composers remove tonality completely, Theodorakis uses different techniques to find the organisational principles. For example, the opening of *Herma* by Xenakis is very dispersed and quite random. Consequently, the solution found by this pianist was to condense the pitches into one octave and look for harmonic entities within the pitches. On other occasions, when he can recognise easily the compositional process, he uses knowledge of those methods to find logic in the music. This was the case for *Mists* by Xenakis:

> It is quite easy to find an intervallic structure in the piece Mists, because Xenakis uses his *Principle of Sieves*, if you know about this. It is a method in which he constructs scales, which are not repeated in the octaves and go through the whole range of the instrument. This is the main scale [played the scale]. This is a succession of intervals. When a particular scale is in use, then it is like as if there are no other keys, everything that happens here on this scale would have this complete intervallic structure. It doesn't matter if there are clouds or melodies, you will have the same sound, you will have the same intervals. Of course he doesn't only use this scale, he uses other rotations and transportations, but the principle is the same and this is also a great help (ET, p. 443, p. 2707-2716).

Although non-tonal music does not follow the standard rules of tonal repertoire, some contemporary composers still follow very strict principles when composing their works. In Xenakis's case these include stochastic composition, sieve theory or general theories of musical time (Squibbs, 2002). Theodorakis suggests that when a pianist spends enough time studying composers and their works, it is possible to acquire knowledge of their methods and use it to encode the information in a meaningful way. Nevertheless, he recognises that this can only be achieved when one truly knows the language:

> Of course experience in this field is a demand, it is really important. An intellectual approach is also very important. You don't have to be a theorist or a composer necessarily. But, even if you play a monophonic instrument, a violin or a flute, it is important to know about composition methods, systems and what atonality is about. And to understand the language of every music piece. I mean, it is important to know what features or elements of the part you are playing are really significant. It is really like understanding a language. I assume you don't speak Mandarin, just like me; it is still possible that we memorise poems in Mandarin and recite them also in public. It would take unusually a lot of time to practice this. Why? Because, we don't know the language. We are going to encode the sounds in our own ways and make our own associations, which will probably not have anything to do with the language. But if you know the language, then it is really simpler, much simpler (ET, p. 452, lines 3030-3041).

Theodorakis has become well known for his extraordinary memory abilities, particularly in relation to complex non-tonal repertoire. From his descriptions, it appears that the decades spent learning this repertoire, together with his practical experience as a composer, resulted in storage of very specific knowledge of this domain, which he uses to give meaning to non-tonal information, as predicted by existing theories of expert memory (Gobet, 2015).

3.3.4.4 Memory Types

While describing their experiences of memorising, all of the pianists touched upon the use of different types of memory. Several spoke about the importance of kinaesthetic memory, which they identified as muscle, physical or motor memory. Ball considers this type of memory vital in non-tonal music:

> I think what I rely on the most is muscle. Actually, I know that it is not fashionable, but that is why fingering is so important to me. I think that's got the sort of wellspring of the quick, intuitive, almost reflex movements. Well, not almost, but definitely reflex movements that you need for that sort of difficult frame, complex, and basically not tonal music. So if it is hard sort of finding chords that you know, necessarily, the chords that are just specific to a piece (AB, p. 384, lines 154-158).

Ball believes that "muscle" memory becomes even more essential when recognisable music entities can't be easily found. Nevertheless, he highlights that this type of memory needs to be properly developed. In this case, choosing the correct fingering from the start is essential. Zolinsky shares the same opinion:

> For physical memory, I think it's very important that you sort the fingering out. I am always going on about this to my students, because there is a printed fingering in front of them and I see they do something different and I know it is going to cause memory problems, because this means two things: number one, possibly a decision hasn't been completely made, so without realising when they are practising, one time they can be putting the third finger down and other time they can be putting the fourth finger down. The other reason is that what the eye sees and the brain computes is different from what the hand is doing. So the eye sees third finger, sends that message to the brain because it's finger three on the page, but the hand actually puts the fourth finger down, so it's like any computer where you have conflicting information and it is just not giving you anything back (AZ, p. 395, lines 591-602).

According to Zolinsky, the constant change of fingering as practice progresses will hinder a proper development of "physical memory". Also, he warns that if pianists don't sort the fingering out and write their official decision on the score, they will execute one specific action while processing a different one visually and such discrepancy can have negative consequences afterwards.

Usually, in previous literature, "musicians talk about motor memory 'as being in the hands'" (Chaffin, Logan, & Begosh, 2009, p. 355). The pianists in this study provided similar descriptions, but some of them noticed that in some contemporary pieces they not only develop physical memory in their hands, but their whole body. When explaining how he developed incidental memory of Boulez's *Second Sonata*, Goddard noticed:

> It was in my body, it wasn't just in my hands. So, all the sort of coordination of my arms and my shoulders and everything, it wasn't just my one, two, three fingers, but it was the entire thing have been mapped into my body (CG, p. 426, lines 1982-1985).

More than just feeling that the music had been mapped into his fingers, Goddard felt the music with his entire body. He reported thinking about "how the piece was danced and just being able to move with the music" (CG, p. 429, lines 2079-2080). Triantafillou reported a similar approach, mentioning that "in contemporary music, you should feel that the body is part of the piece, the approach is different and the feeling" (CT, p. 409, lines 1231-1232).

Ball, Zolinsky, Triantafillou and Theodorakis also highlighted the importance of being able to imagine the sound of the music in their mind, a process often associated to auditory memory (Ginsborg, 2017). Zolinsky also mentioned visual memory, noticing that even though he does not see exactly what is written on the score, he has "a sense of where something is on the page and somehow that ignites the memory" (AZ, p. 394, lines 589-590). Theodorakis also mentioned relying on this type of memory as an "extra aid":

> I also do it photographically, this is kind of an extra aid of memory. It is mostly with pieces that I have learned recently. I always know when the pitch changes, or when there is a line break, or where the systems change. This is a kind of memory which is not a musical one, but it helps. You don't get lost (ET, p. 442, lines 2600-2604).

Finally, the pianists also mentioned that these memories need to be accompanied by "thinking about what is happening", about "the structure of the music" (AZ, p. 395, lines 623-624), and by thinking "how the piece works together as a totality" (CG, p. 434, line 2258). Philip Thomas also mentioned that when he used to memorise music, he focused a lot more on music shape than he does now. Triantafillou emphasized the importance of being aware of the general scheme of the piece that, in contemporary music, he sees as music geometry. These descriptions are very similar to the concept of *structural memory* proposed by Chaffin et al. (2009, p. 504), which is "the musical

equivalent of Rubin's *narrative memory:* memory for the overall sequential organisation and goal structure of a story or biography".

The pianists in this study did not report favouring one kind of memory over the others. Their memorisation process appears to rely on a combination of different memory types and is adapted to the type of piece and task constrains.

3.3.4.5 Dealing with Switches

Goddard, Triantafillou and Theodorakis also mentioned a major memorisation challenge, related to the appearance of the "same motives, but [with] slightly different repetitions (ET, p. 448, line 2874). This feature is present in several styles of repertoire and has been referred to in previous studies on music memorisation as *switches* (Chaffin et al., 2002). Theodorakis mentioned finding this feature in works by Messiaen or Claus-Steffen Mahnkopf and noticed how it can become a true challenge for memorisation. When asked how he deals with this issue, particularly in the piece *Vingt Regards sur l'Enfant-Jésus* (No. 6) by Messiaen, he answered:

> This took some time, lots of movies and videoclips watching in Amsterdam [laugh], at the same time, and trying to bring everything in my head without getting confused. Of course I invented some places, some features to hold on to. For instance, what is the initial chord that every bar starts with [exemplified the beginnings of every chord]. Every triad has a different character [continued exemplifying different chords]. Look, this is really confusing [continued demonstrating the differences between the chords]. And then the *angradissement* goes further, but now it has different periods, so the left hand has a different repetition period than the right hand, and then it is easier, paradoxically. But it is easier because every bar is now notably different (ET, p. 448, lines 2849-2858).

Similarly to other professional musicians who addressed switches in previous studies (Chaffin et al., 2002; Chaffin et al., 2010; Hallam, 1997), Theodorakis devised strategies to avoid confusion with similar passages, by developing specific cues to help him clearly distinguish those elements in the music.

3.3.5 Performance Experiences

The practice and memorisation preparation described above will eventually culminate in a very special moment, the final performance. All pianists in this study described how they experience this moment. Ball tries to live the moment as much as possible:

> I try just living the moment as much as possible […] when I am playing at my best, is just living in the moment and when it really works well, and that is not by any means all the time, my feeling is that, I feel as I am not really having to play it myself, I feel as if I am sort of floating above what is happening, but that doesn't happen all that often, but that is the best feeling one has (AB, p. 384, lines 174-182).

For this pianist, the ideal performance situation is when one is secure enough to just enjoy the experience and float above it. Theodorakis reported perceiving the audience's feedback:

> […] when you enter the stage you have already the first feedback of the audience, if they like you. Well sometimes you play for audiences that know you and then it is like a party, like playing for friends, even if you don't know personally everybody in the audience. If you play in a venue that you have played many times, you probably know the audience (ET, p. 451, lines 3015-3019).

More than just reacting to audience's responses, Thomas spoke about how he ensures music is alive and fresh in every performance and how to avoid duplicating the same experience:

> I want, as much as possible, to keep music alive. First of all, I have said, you want to perform the music, not replicate it, and we don't want to think 'here is something that I have been practising and practising and now I am going to duplicate that experience for you, but in the concert hall'. I want music to be tangible and alive in the performance (PT, p. 459, lines 3355-3359).

During performance, Thomas reported listening very carefully to the sound. Triantafillou shared the same experience, noticing that he is mainly focused on listening to himself, as if he was in the audience:

> […] I have only the sound, the sound that I want to express at that time with that piece. I don't think, I simply listen to the sound, I listen to myself like I am in the audience. I let myself and enjoy all of this (CT, p. 410, lines 1286-1288).

Although living in the moment and focusing on the resulting sound was described by some pianists as the ideal experience, some underlined that the performance also needs to be monitored. For example, Ball observed that "[…] of course one has to anticipate it, as I just said one has to think ahead for difficult moments. But not too much ahead or you will lose the sense of being in the now" (p. 385, lines 174-176). Zolinsky also mentioned that when the piece is particularly difficult to memorise, it is important to focus on specific cues, such as "sequences of harmonies or certain fingering" (AZ, p. 398, line 721). Goddard noticed that in brutally physical pieces,

such as the Boulez's *Sonata No. 2*, it is also important to pace the energy and tension in order to "retain something for the last [moment]" (CG, p. 428, lines 2026-2027).

Several pianists also pointed out the constant emergence of extraneous thoughts. Thomas admitted that, although he tries to focus on the sound, is difficult to avoid thinking about peripheral things during performance:

> I am trying to listen to the sound. I am thinking about the moment that I am in, but if I am honest I am also thinking 'ok, that bit is over', or 'don't forget a couple of notes over the next page', or 'what is that person thinking over there?', 'did I just see someone when I bowed in the previous piece?', or 'why did I choose to play this piece?', or 'oh, I really love this piece!'. I am thinking of all those things as well. Maybe a lot of people are that musical maestro, completely in the poetry of the moment. I actually find poetry in every day life as well, don't you think? I don't like to separate art from life, but if I have to be honest, I am thinking about real world things as well, or I am coursing myself, because I didn't get that bit right. And no matter how many times I tell my students, once is in the past is in the past, move on, keep going, I am the same as them. It hurts when you get something wrong and you just want to kick yourself [laugh] (PT, pp. 466-467, lines 3649-3660).

Theodorakis mentioned that when he is relaxed about the performance, he also has thoughts unrelated to the music: "Well, if I am really relaxed and I have played the piece more times, then I also try to think about other things. For instance what I am doing after the concert [laugh]" (ET, p. 450, lines 2990-2991).

Although Thomas and Theodorakis did not mention being disturbed by this type of thoughts, Ball noticed that there are specific thoughts, such as "thinking about what has happened", that can lead to disaster. Zolisnky also pointed how important it is to run away from negative feelings and focus on positive thoughts.

3.4. GENERAL DISCUSSION

The present study sought to investigate professional pianists' views on performing from memory and to explore practice and memorisation approaches in contemporary piano repertoire. The very rich descriptions emerging from the six interviews demonstrated distinct views towards the practice of performing from memory, as well as a wide range of approaches used to prepare contemporary piano repertoire for performance.

Some pianists stressed how contemporary music is, ultimately, music. This means that this repertoire is basically learned the same way as other musical styles. Nevertheless, all pianists identified features of this repertoire that can become true

challenges for learning and memorisation. First, several contemporary piano pieces do not contain obvious patterns and structures. Standard patterns and structural forms are commonly found in tonal musical styles, but they are often obscured, concealed or even absent in contemporary piano repertoire. Second, the musical writing is often problematic, as it is mainly based on compositional procedures, but not performance oriented. Zolinsky believes that this issue directly affects the development of physical memory. This issue has also been addressed by other performers of contemporary music in previous research (Thomas, 1999).

In relation to performing contemporary repertoire from memory, the views were diverse. While Theodorakis and Triantafillou perform everything by heart, including the most complex contemporary music, Thomas prefers to perform everything from the score. Zolinsky and Ball have memorised some contemporary pieces, but played others with the music. Goddard has set out to memorise some contemporary pieces, while others were actually memorised unintentionally.

The pianists identified several factors involved in their decisions to play from memory or with the score. Particularly in more standard repertoire, the tradition of performing from memory appears to have an impact. Zolinsky and Ball criticised these conventions, but also admitted feeling inclined to prefer memorised performances. Previous research has also suggested that musicians can be "biased in favour of performances without the music stand" (Williamon, 1999b, p. 93).

All pianists also reported several benefits from this practice, namely deep knowledge of the music, freedom, improved listening and communication and the ability to work the music in their mind. Most of these benefits have been repeatedly reported in previous literature (Chaffin et al., 2002; Elder, 1989; Hallam, 1997; Noyle, 1987; Williamon, 1999b). Nevertheless, some pianists also pointed out limitations, such as the extra anxiety caused by fear of memory failure and the extra time spent memorising. This last point was particularly emphasised in relation to contemporary music, because of the particular challenges posed by this repertoire. Since this music struggles to get a large number of performances, some pianists questioned the point of going to the extra trouble of memorising it. Nevertheless, Triantafillou, for example, mentioned that he memorises pieces because he likes to go through this process and prefers not to have anything in front of him in performance.

The multiplicity of compositional methods employed in contemporary piano repertoire resulted in varied approaches to practice and memorisation. The general

descriptions of practice, however, fitted remarkably well with existing descriptions of practice behaviour at higher levels of expertise (Chaffin et al., 2013; Miklaszewski, 1989; Mishra, 2005; Nielsen, 1999; Williamon & Valentine, 2002).

All pianists spoke about the importance of identifying the task demands before engaging in detailed work (Chaffin et al., 2003). Theodorakis spoke particularly about how he examines the principles employed in the piece early in the process. Triantafillou mentioned searching for the geometry of the piece, which refers not only to how the composer's ideas are organised in the music, but also how they will be interpreted and embodied by the performer. The geometry incorporates more than the representation of conceptual elements, including also the movements embodying the general music scheme and generating a particular sound.

All these descriptions resemble problem-solving strategies reported in previous studies with professional musicians, such as understanding the big picture or the artistic image of the piece before approaching a complex task. In previous literature this artistic image has usually been associated with the overall shape of the music and to structural features (Chaffin et al., 2003). However, some pianists such as Philip Thomas noticed that in certain types of repertoire, such as experimental music, these ideas of shape, structure, phrasing or even unity can be completely disrupted. Therefore, he avoids thinking about the music as a whole.

With regard to segmentation strategies, all of the pianists reported using a segmented approach, which actually appears to be a favoured method among experienced musicians (Chaffin & Imreh, 2001; Gerling & Dos Santos, 2017; Mishra, 2005). Previous research has found that musical structure is often used as a criterion to segment practice and to guide encoding and retrieval (Williamon & Egner, 2004; Williamon & Valentine, 2002). Nevertheless, in relation to contemporary repertoire, these pianists mainly mentioned using visual layout of the score (specific bars, systems or pages). Observational research on music memorisation has neglected score layout as a possible criterion to segment practice and has mainly focused on the role of structure (Chaffin et al., 2010; Chaffin & Imreh, 2002; Williamon & Valentine, 2002). Most pianists also stressed the importance of processing all musical elements simultaneously, instead of focusing first on basic elements (e.g., notes and rhythm) and later adding extra detail.

Because this study was focused on contemporary piano music, the pianists also reported specific practice strategies particularly useful for this repertoire, such as

rewriting problematic notation to help decide practical issues (e.g., fingerings), or to make personal decisions (e.g., improvisation). Some mentioned marking the rhythmic framework of the piece on the score, highlighting the location of the general pulse to guide them through very complex rhythms.

The pianist's reports on their memorisation techniques revealed, as in previous studies, idiosyncrasy and variety, depending on the personal learning styles, task demands and type of repertoire (Mishra, 2005; Williamon, 1999a). Some pianists reported using a deliberate approach to memorisation, while others just prefer to let memorisation take its natural course and develop spontaneously. Although contemporary music is usually considered more difficult to memorise (Hamilton, 2008; Mishra, 2005; Oura & Hatano, 1988), Goddard and Zolinsky noticed that memorisation can also be developed naturally in this music, although it takes time and investment.

All pianists spoke about the benefits of practising away from the piano, particularly in relation to memorisation. Musical analysis was considered to be a powerful tool to deal with the complexities of contemporary scores, or to understand how pitches interact. Ball reinforced the idea that this analysis can be very subjective and personal, and not necessarily related to the structural principles used by the composer. The potential of this practice as a complement to memorisation, as well as different types of imagery, has been suggested in previous research (Clark et al., 2007; Holmes, 2005; Rubin-Rabson, 1937). Nevertheless, previous observational studies examining preparation for memorised performances by expert musicians have not examined in depth the role of this practice for memorisation (Chaffin & Imreh, 2002; Chaffin & Lisboa, 2008; Ginsborg & Chaffin, 2011).

Another strategy mentioned by some pianists is very well known in literature on expert memory and is often referred to as chunking (Gobet et al., 2001). This technique consists of grouping the pitches into meaningful units. In tonal music, musicians can chunk the information into well-known tonal patterns, such as chords, intervals or scales (Halpern & Bower, 1982). Triantafillou and Theodorakis reported using the same technique in contemporary repertoire, but using different types of chunks. Triantafillou reported chunking the notes into hand shapes, a strategy reported in previous studies as blocking and also considered effective for memorisation (Nellons, 1974). Depending on the piece, Theodorakis uses different organisational principles to chunk the information. If the piece has elements

associated with tonal vocabulary, he associates the new information to tonal patterns. Nevertheless, if tonality is completely absent, he often relies on the compositional models employed by the composer. For example, he used the mathematical Theory of Sieves to find organisational principles in Xenakis's *Mists* (Squibbs, 2002).

The technique of chunking material into meaningful units based on stored knowledge of the domain is usually advocated in theories of expert memory (Gobet, 1998) and has been used to explain expert memorists' exceptional memory abilities. Theodorakis has performed a wide range of contemporary repertoire for several decades and is himself a composer. Therefore, he appears to have acquired an extensive knowledge of this domain, which allows him to encode the information in a meaningful way. His remarks suggest that the chunking principle often advocated in theories of expert memory can apply to contemporary music, when musicians have acquired specific knowledge of this domain (Gobet, 1998).

The pianists in this study also mentioned the use of different types of memory while encoding and retrieving contemporary works. Several highlighted the important of kinaesthetic memory in this type of repertoire, particularly when it is not easy to find conceptual principles in the music. One interesting insight was that some musicians feel that, in some contemporary pieces, this type of memory is not only developed in their hands, but in their entire body. Because some pieces are so physically demanding or involve so many body movements, the performance of the music becomes almost choreographic. Besides kinaesthetic memory, some pianists also mentioned relying on auditory, visual and conceptual memory (Chaffin et al., 2009). The pianists in this study did not favour one type of memory over the others, relying on a combination of the different types, as has often been noted in previous studies on music memorisation.

When the moment of the performance arrives, several pianists in this study have reported living in the moment as much as possible, although some recognised that monitoring of the performance is also necessary, highlighting the importance of focusing on specific landmarks or of pacing the energy in very demanding pieces. Some of the landmarks, such as specific fingerings or harmonies, resemble the concept of PCs advocated by PC theory (Chaffin et al., 2002; Ginsborg et al., 2012; Ginsborg & Chaffin, 2011). Some pianists also noticed how they are sometimes dominated by external thoughts and highlighted the importance of avoiding negative thoughts.

This study provided very thorough descriptions of how experienced soloists tackle the complex challenges faced in memorising music contemporary piano music. Several insights were related to previous accounts of expert music memorisation proposed in the literature (Chaffin et al., 2002; Chaffin & Lisboa, 2008; Mishra, 2005). Nonetheless, specific insights, such as the use of the visual layout of the score for segmentation, the use of practice away from the piano, or the use of chunking based on the contemporary models of compositions, still lack further investigation. The subsequent studies of this thesis will explore these issues in further depth, by observing the entire process of learning and memorisation of non-tonal pieces by different musicians.

4 RETRIEVAL PRACTICE OF A COMMISSIONED PIECE FOR PREPARED PIANO

4.1 INTRODUCTION

The accounts of experienced pianists examined in the previous chapter open the door to a better understanding of learning and memorisation in the context of music defying tonal language, traditional formal structures and performance practices. This chapter will explore the subject in further depth by thoroughly analysing the entire process of learning and memorisation of a newly commissioned non-tonal piece for prepared piano.

During the twentieth century, piano music saw the development of a compositional trend provocatively challenging conventional piano performance, known as *music for prepared piano* or *using extended techniques* (Hudicek, 2002). This music goes beyond the basic piano technique of pressing a key to strike the instrument strings. The inside of the piano becomes a new sound world of possibilities when the pianist plucks, strums, plays glissandos and harmonics on the strings, and introduces new objects onto the soundboard (Jeffrey, 2012; Shockley, 2018). This urge to find innovative forms of artistic expression has accompanied composers in their evolution of artistic practice as they explore novel combinations of pitch, rhythm, structural frameworks and new ways of manipulating musical instruments (Vanhecke, 2014). The unceasing craving to break traditional practices can also be found in performance arts such as contemporary dance. Choreographers persistently attempt to reconceptualise the notion of body and movement (Stevens et al., 2019).

Music for prepared piano challenges the pianist on several levels. First, it disrupts standard performance procedures by going beyond the traditional practice of playing exclusively on the keyboard, and also uses the soundboard as a performance device (Hudicek, 2002; Vaes, 2009). Second, the pianist needs to work on body coordination to execute movements between the keyboard and the soundboard successfully. Third, the constant flow between the different parts of the piano often demands the music stand to be removed, not allowing the musician to have the score

in its usual place. Finally, the visual representation of the pieces on the score is often unconventional, using more than two staffs or other unconventional score layouts, such as circular or spiral forms.

Understanding how musicians learn and memorise complex pieces that rebel against traditional practices can provide important insights into the intricate representations formed by musicians in long-term memory (LTM). The remarkable complexity of learning and performing this music may raise an important question: do existing theories of music learning and memorisation apply to this type of repertoire?

As previously mentioned, PC theory has become a theoretical account largely addressed and discussed in the literature in this field (Chaffin et al., 2002; Ginsborg et al., 2012). This framework accounts for the complexity of musical performance by acknowledging the varied processes governing encoding and retrieval of a musical piece (see Section 1.3.3.2).

The theory suggests a duality between a type of memory spontaneously developed during learning (*serial cueing*) and a more conscious memory developed when approaching the music from a conceptual perspective (*content addressable*) (Chaffin et al., 2009). Novices appear to rely mainly on the first type (Hallam, 1997; Lisboa et al., 2015), but skilled performers usually aid spontaneous memory with more deliberate memorisation strategies (Chaffin et al., 2002; Hallam, 1997; Mishra, 2005).

One example of a deliberate strategy is the development of an adaptable retrieval scheme with different hierarchical levels and PCs. The hierarchical organisation of the scheme and the type of PCs used appears to depend on the musician and type of music. However, formal structure emerges consistently at the top levels of the hierarchy (Chaffin, 2007; Chaffin et al., 2010; Chaffin, Demos, et al., 2009a; Chaffin & Imreh, 2002; Ginsborg & Chaffin, 2011).

The premise that musicians use their understanding of musical structure to organise their encoding and retrieval of musical information is consistent with assumptions of current theories of music cognition (Chaffin, Logan, et al., 2009; Clarke, 1988; Mishra, 2005) and is supported by studies examining musicians' behaviour and neural correlates (Williamon et al., 2002; Williamon & Egner, 2004). Moreover, it can also be remarkably well explained by principles of skilled memory theories (Ericsson & Kintsch, 1995; Gobet, 2015).

Recently, these principles were extended to non-tonal piano music composed by Messiaen (Soares, 2015) and Schoenberg (Chueke & Chaffin, 2016). Both studies suggest that music structure and PCs, even if intuitively and subjectively grasped by the musician, form the basis of the developed retrieval scheme. Although non-tonal, the excerpt memorised by Soares (2015) is based on the traditional rondo form. One may argue that he was able to intuitively grasp the structure because it was embedded into the music and was part of his previous knowledge of musical structural forms. The music in Chueke and Chaffin's (2016) study was deliberately composed without a unifying plan, but the study was limited to the first four bars of the piece.

This study extends previous PC research to a long and complex piece that challenges tonal language and traditional performance practices.

4.2 THE STUDY

4.2.1 Aims

This research aimed to extend previous longitudinal case studies to a non-tonal composition of long-duration and high performance complexity. The first aim was to evaluate to what extent existing memory theories (e.g., PC theory) apply to non-tonal music following unconventional practices (Chaffin et al., 2002; Chaffin, Logan, et al., 2009; Ginsborg et al., 2012). Music for prepared piano not only uses unconventional musical languages and structures, but also requires a change in the performance behaviour (Lee, 2019). This study examined if these new performative demands affect the type of retrieval scheme developed by musicians in this context.

The second aim was to compare the strategies used to learn and memorise this type of repertoire with previously reported expert problem-solving approaches. Experienced musicians usually form a conception of the *big picture* of the piece before start working in detail on more specific musical dimensions (Chaffin et al., 2003, 2013). They have also reported working on a retrieval structure based on their understanding of the formal structure and with different types of PCs (Chaffin & Logan, 2006). This study assesses if these strategies apply to a commissioned piece for prepared piano. The absence of previous aural models and the difficulties created

by the extended techniques to sight-read the piece may obstruct a rapid grasp of its artistic form. These challenges may also affect how the learning is organised and progresses over time. This study examines in detail the stages of learning the piece *If You Were Here* by Wynton Guess and compares them with previous studies.

The final aim was to extend previous research on long-term recall to non-tonal piano repertoire. An examination of a written recall test conducted nine months after the performance provides the opportunity to identify which music features remained in LTM.

4.2.2 The Pianist

In this practice-based research the author is the subject of the study. I am a pianist trained in Western classical music. This study was conducted when I was studying at the Royal College of Music (RCM) at doctoral level. Currently, I am a lecturer, piano teacher and accompanist at Universidade do Minho in Portugal. As an active solo and chamber music pianist, I frequently perform music from the baroque, classical and romantic periods, but also a wide range of contemporary piano repertoire. After concluding my bachelor's studies, ten years ago, I have studied repertoire from 20th and 21th century. Since then I have also developed close collaborations with contemporary composers and premiered several solo and ensemble piano works.

4.2.3 The Music

The piece used for this study is *If You Were Here,* composed in 2015 by Wynton Guess (unpublished), a master's student in composition at the RCM at the time. The piece is the product of a collaborative project carried out as part of the RCM postgraduate program "Contemporary Music in Action" (Doffman & Calvin, 2017). The project invites composers and performers to collaborate in the development and performance of new works. I embraced this opportunity to ask the composer to create a piece for this study defying tonality and current performance practices.

Wynton Guess accepted the challenge and created the piece *If You Were Here* for prepared piano. This work uses a combination of modal and atonal music language systems. A motif found in the song *Wish You Were Here* from Pink Floyd's

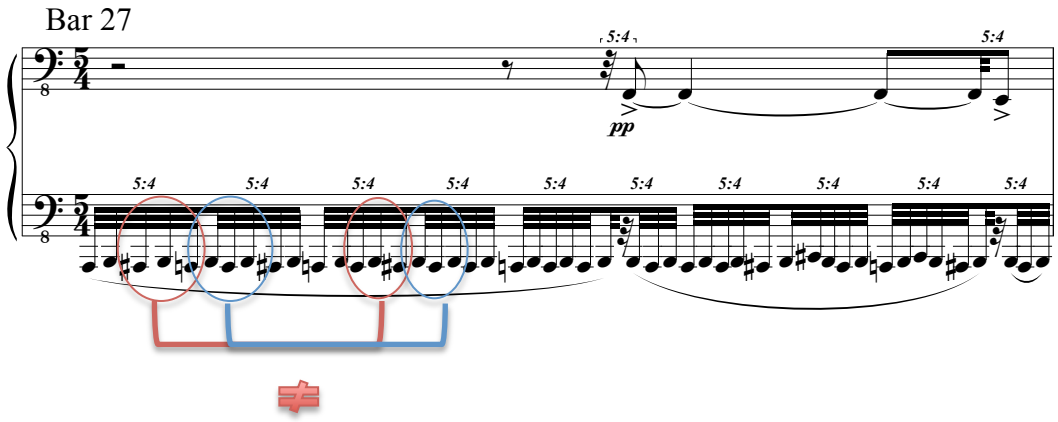
album *Shine On You Crazy Diamond* is explored and deconstructed. The performer expands the sonic world of the piano by plucking and playing glissandos on the strings, by resonating their harmonics and by introducing objects, such as a metal chain on the soundboard. The resulting piano resonance mimics the sound characteristics of an electric guitar. Composed of 534 beats, this work lasts around eleven minutes.

If You Were Here challenges the performer on several levels. First, the use of extended techniques requires uncomfortable sitting and standing movements while constantly holding the pedal with the right foot. Since playing on the piano strings is not a normal practice in traditional piano training, most pianists will struggle with identifying the notes produced by the strings by heart. The most often used solution is to mark the strings with stickers. This requires time-consuming preparation of the piano before practice. This type of piece can only be performed on a grand piano, restraining the performer's practice possibilities. An additional difficulty is that different brands of grand pianos have different soundboard designs, changing the way the strings are organised. This compels pianists to adjust their visual representation of the strings every time they perform on pianos of different brands.

Second, the piece presents several technical challenges, such as fast tempo with recurrent crossing of hands, which does not allow enough time to think about what is coming next.

Third, the music is highly difficult for the pianist, challenging not only technique, but also memorisation. For instance, it builds on a rapid, nebulous passage, which starts very softly in the left hand (see Appendix 4). This sequence of notes sounds like a trill. However, this trill is not formed of two notes, as is usual, but four notes arranged in slightly different orders throughout subsequent beats (see Figure 1).

Figure 1. Passage in the Left Hand of Bar 27, Composed of Four Notes Arranged in Slightly Different Orders.



The difficulty of memorising similar musical material with minor differences has been reported in previous longitudinal case studies as a major memory challenge, and is commonly referred to as *switch* (Chaffin et al., 2002; Chaffin & Lisboa, 2008). However, in classical and baroque repertoire switches usually appear between similar structural sections (Chaffin, Imreh & Crawford, 2002). For example, the re-exposition of a piece will be similar to the exposition, but with minor changes. *If You Were Here* explores the use of switches on a new level, by placing small differences on every beat within sequences of more than twenty bars in a row. For clarity, this type of passage will be here identified as switch sequences. Finally, the structure of the piece does not resemble conventional frameworks used in tonal piano repertoire. The understanding of structure needs to be idiosyncratic and intuitive.

The piece was recorded in 2017 and is available on SoundCloud.[18] The recording was completed after finishing all data collection and transcription for this study.

[18] https://soundcloud.com/wyntonkellystoneguess/if-you-were-here.

4.2.4 Procedure

The study design, based on protocols established by Chaffin & Imreh (2002) and Chaffin et al. (2010), used different observational methods to examine the entire learning process of the piece *If You Were Here*. A total of 57.66 hours of practice spread across 60 practice sessions were video recorded from the first reading of the piece until the final performance.

The study lasted a total of four months (from May to August 2015) and resulted in two performances. The second performance was not initially planned, and was a result of an invitation received after the premiere of the piece. The learning process was then divided into two major periods separated by the two performances with a one-month break in between.

As mentioned before, this piece resulted from a collaborative project with the composer Wynton Guess, which required some meetings to discuss how the piece should be performed. In order to avoid as much as possible the influence of the composer on the learning and memorisation process, our collaborative meetings were only held after memorisation of the piece was complete (see Table 3, p. 130). During both meetings I performed from memory for the composer and we discussed interpretative and performative ideas. His insights could have had impact on my interpretative and expressive thoughts right before the first performance, but at this point the piece had been already memorised.

4.2.4.1 Video Recordings of Practice

In total, 60 practice sessions and two public performances were video recorded and later transcribed for analysis. Following a protocol described by Chaffin et al. (2002), the video camera was placed in a position that captured my hands and face, in order to help identify whether I was looking at the score or playing from memory.

All video recordings were transcribed using SYMP (Study Your Music Practice), an analysis tool created in Microsoft Excel (2007/2010), developed by Alexander Demos and Roger Chaffin for the longitudinal case studies studying the development of PCs (Chaffin, Demos, et al., 2009b; Demos & Chaffin, 2009). SYMP provides a summary of practice recorded on audio or videotape from my transcriptions.

The transcription process consists of identifying *practice segments* in the video or audio data. A practice segment refers to "any continuous playing of the score" during a practice session. A segment ends when the musician interrupts the continuous playing and performs a different musical passage or repeats the same one. Following Chaffin & Imreh's (2001) criteria for the classification of practice segments, "short pauses and hesitations were not treated as the ends of segments" if the performer continued playing immediately (Chaffin & Imreh, 2001, p. 46). A segment length could range from 1 to 534 beats. In this case, the locations in the score were analysed at the beat level, because the analysis of bars was not feasible for a piece with complex and free metrical forms. As illustrated in Figure 2, the spreadsheet indicates for each practice segment the initial time on the videotape, the time spent talking, the starting and stopping beat and additional practice information (purpose of practice, hands played and use of the score). Based on this data, SYMP computes automatically the time spent playing, the number of beats performed and the tempo for each segment.

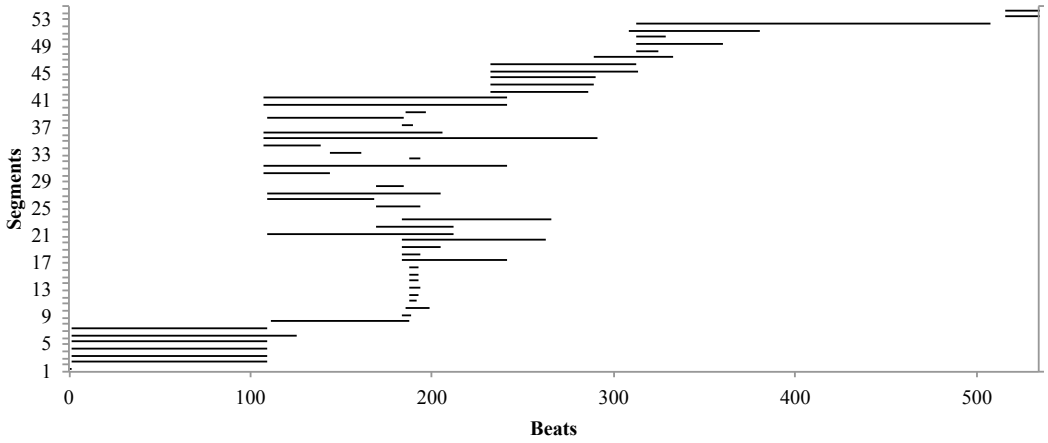
Figure 2. Transcription of Practice Session 1 Using SYMP.

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Practice Sessions	Segment	Start Time on Video Tape (mins)	Start Time on Video Tape (seconds)	Amount of Time Talking (seconds)	Start Beat		Stop Beat		Purpose of practice	Hands	Reading Score/memory	Time Playing (seconds)	Number of Beats played	Tempo for each segment
2	1		1	15	16								15	0,00	0,00
3	1	1	1	46	02	1		6		1	3	1	20	5,00	15,00
4	1	2	2	08		3		6		1	3	1	32	3,00	5,63
5	1	3	2	40	02	3		6		1	3	1	12	3,00	15,00
6	1	4	2	54	09	3		6		1	3	1	31	3,00	5,81
7	1	5	3	34		1		6		1	3	1	34	5,00	8,82
8	1	6	4	08		3		6		1	3	1	13	3,00	13,85
9	1	7	4	21	04	3		6		1	3	1	52	3,00	3,46
10	1	8	5	17	05	8		10		1	3	1	21	2,00	5,71
11	1	9	5	43		8		11		1	3	1	41	3,00	4,39
12	1	10	6	24	06	11		11		1	3	1	17	0,00	0,00
13	1	11	6	47	12	8		10		1	3	1	41	2,00	2,93
14	1	12	7	40		8		11		1	3	1	28	3,00	6,43
15	1	13	8	08	10	12		13		1	3	1	32	1,00	1,88
16	1	14	8	50		12		13		1	3	1	23	1,00	2,61
17	1	15	9	13		12		13		1	3	1	11	1,00	5,45
18	1	16	9	24	02	12		13		1	3	1	18	1,00	3,33
19	1	17	9	44	06	12		12		1	3	1	88	0,00	0,00
20	1	18	11	18		12		13		1	3	1	22	1,00	2,73
21	1	19	11	40		14		14		1	3	1	17	0,00	0,00
22	1	20	11	57		12		14		1	3	1	19	2,00	6,32
23	1	21	12	16		12		14		1	3	1	29	2,00	4,14
24	1	22	12	45		8		14		1	3	1	76	6,00	4,74
25	1	23	14	01		8		13		1	3	2	61	5,00	4,92
26	1	24	15	02		12		14		1	3	1	26	2,00	4,62
27	1	25	15	28		12		14		1	3	1	44	2,00	2,73
28	1	26	16	12	04	15		15		1	3	1	39	0,00	0,00
29	1	27	16	55		16		16		1	3	1	19	0,00	0,00
30	1	28	17	14		16		17		1	3	1	19	1,00	3,16
31	1	29	17	33		12		17		1	3	1	43	5,00	6,98
32	1	30	18	16	16	12		17		1	3	1	-1112	5,00	-0,27
33	1	End session													

SYMP uses the above-mentioned data to auto-generate graphic summaries of patterns of starts and stops during practice, providing an overall idea of how practice is structured. Figure 3 shows the practice graph from session 17. The y-axis indicates the practice segment played. The x-axis represents the length of the segment, by

indicating the starting and stopping beat. The graph should be read from left to right and bottom to top, with each horizontal line representing segments of the piece continuously played during the practice session. Details on how SYMP data were used to analyse practice behaviour will be provided below.

Figure 3. Practice Graph from Session 17, with Y-axis Indicating the Practice Segment and X-axis Representing the Length of the Segment.



4.2.4.2 Reports

Following a protocol analogous to Chaffin et al. (2010), I made two types of self-reports on my experience of learning the piece. Concurrent reports were gathered from two distinct sources. First, while practising, I always attempted to think out loud and comment to my future self on my goals during practice, the decisions I was making, the strategies I was using and my thoughts and feelings. Because I was talking to myself, I felt free to comment on everything it was crossing my mind, including moments of frustration and fatigue. The goal was to keep record of my concurrent thought-processes, which would be impossible to remember accurately later on during the data analysis. Second, important musical decisions were annotated on different copies of the score. In order to have a record of how those decisions evolved over time, different scores were used throughout practice. The score was changed whenever I felt the learning process was changing paths. In total, I annotated seven scores during the learning process. Due to a practical issue, I was forced to change scores in the first stages of practice more often than planned, because the composer was still revising the score layout. For this reason, I transcribed the

annotations made in different scores at this stage into one score with the final version of the music.[19]

In order to examine the use of PCs in both memorised performances, I wrote on a fresh score all my thoughts during performance immediately after leaving the stage (See Appendix 5). The procedure reported by Ginsborg et al. (2012) was adopted, thus incorporating reports of all types of thoughts during performance, not just PCs.

A detailed analysis of different types of thoughts during performance was later considered to be outside the scope of this study but will be further explored in the future. When the analysis of the data began, around one year after the last performance, I retrospectively analysed the performance reports and selected the features used as PCs to aid memory during performance. A thought was considered a PC if "corresponded to a thought [during performance] about a similar kind of feature at the same location in practice (Ginsborg et al., 2012, p. 209). The understanding of the formal structure was also marked on a new score after the last performance.

4.2.4.3 Recall After Nine Months

After performing the piece for the second time in August 2015, I stopped practising and avoided listening to any recording of my practice or performance. Nine months later, I was asked to relearn the piece to prepare for a lecture-recital in Novi Sad, Serbia. Before re-starting my practice sessions I sat down and wrote out as much as I could remember of the piece.

4.2.5 Data Analysis

The different types of data were analysed through a mixed-methods approach using qualitative and quantitative instruments. A summary of data analysis methods used for each data type is presented in Table 2.

[19] The composer only performed amendments to the score layout (ex: placement of bars or systems on the page). The music material was the same for all scores.

Table 2. Summary of Methods of Analysis for Each Type of Data Collected.

Data type	Source	Analysis
Musical decision reports	Annotated scores 1–5	Qualitative categorisation of musical decisions
		Quantitative computation – percentage of musical decisions for each category
PC and structure reports	Annotated scores 6–7	Qualitative categorisation of PCs and structural boundaries
Verbal comments	Video recordings	Content analysis
Practice records	Video recordings	Quantitative computation – frequency of starts, stops and repeats for each beat during practice
		Multiple regression analyses relating practice records to self-reports
Written recall	Written score	Scoring of recall accuracy
		Identification of serial position effects
		Multiple regression analyses relating probability of recall with self-reports

The reports from the annotated scores were sorted into different types of musical decisions and grouped into wider categories. Categorisation was based on previous longitudinal case studies (Chaffin et al., 2010; Chaffin & Imreh, 2002; Lisboa et al., 2015).

Comments during practice were fully transcribed and categorised into different topics using content analyses. The transcript was divided to ensure that each passage corresponded to a single topic. When such division was not possible, the number of topics for each passage was noted (Chaffin et al., 2002, p. 203). The percentage of topics and categories identified in the annotated scores and comments was computed to examine the evolution of decision-making and thought processes during practice. Practice behaviour was analysed by calculating the frequency of starts, stops and repeats for all 60 sessions.

The written recall test was scored for accuracy using the method described below. Since this is a polyphonic piece, each voice was scored for accuracy. Crotchet

beats [20] were the unit of analysis. Pitch and rhythm were scored separately. If the pitch or rhythm of the voice was correctly recalled the score was 1 and if incorrect or absent the score was 0. These scores were used to examine accuracy of recall separately for the right and left hands, total pitch and rhythm accuracy, and total accuracy. The resulting scores were then used to assess probability of recall.

The relationship between empirical records of practice, self-reports and probability of recall was assessed using multiple regression analysis, a method previously used by Chaffin & Imreh (2002), Chaffin et al. (2010), Chaffin et al. (2013) and Soares (2015).

Retrospective analysis of concurrent reports during practice (comments and annotated scores) was used to divide the practice process into different stages of learning, as described below. For each learning period, multiple regression analyses were carried out using frequency of starts, stops, repeats and probability of recall as outcome variables. Predictor variables were the musical structure of the piece, musical decisions during practice and PCs. These variables were extracted from the annotated scores.

Since I had seven annotated scores with musical decisions and two PC reports, an overall set of musical decisions and PCs was extracted. The criterion was to select as predictors decisions and PCs [21] that were present in at least two reports. Analyses of concurrent comments also suggested that score layout (beginning of pages and systems) influenced segmentation processes during practice. For this reason, page and systems boundaries were also considered as predictors. In total, 20 predictors were used in the analysis of practice (see Table 10, p. 179). All predictors were coded by a dummy variable identifying the beats of the piece where the features were located (Chaffin et al., 2010).

Analysis of long-term recall used serial position in the musical structure and different types of PCs as predictor variables, while probability of recall was the dependent variable. For each predictor, the serial position effects were coded by numbering the beats sequentially until the next structural point or cue. Following Chaffin et al.'s (2010) criterion: "a maximum value of 7 was used, with serial

[20] In the musical system used in the USA, crotchet beats are identified as quarter notes.
[21] For locations where multiple PCs were reported, a retrospective selection of PCs was carried out by selecting the PCs that were really significant to the memorised performance of the piece.

positions of 7 and greater receiving the same value, in order to ensure a minimum of eight observations for each serial position" (Chaffin et al., 2010, p. 20).

4.3 RESULTS

If You Were Here was one of the most challenging pieces that I have ever memorised during my studies and professional career. At one point during the learning process I actually thought that I would not be able to memorise this music, but ended up overcoming this difficulty and playing it by heart confidently.

Practice will be here described in terms of temporal groupings (learning periods) and main goal of practice (stages), which will be addressed more fully in the next section. The first period of practice lasted around two months, totalling 47.31 hours. The piece was premiered in a music festival in Portugal on the 18th of July 2015. After a break of one month, the piece was revisited one week and a half before a second performance, totalling 10.35 hours.

Table 3 presents a timeline illustrating the distribution of the 60 practice sessions across 16 weeks. Practice was divided into two main learning periods and five learning stages, which will be discussed below. Different columns indicate the dates and number of practice sessions recorded, their duration and the reports completed during each period.

Table 3. Timetable with Distribution of Practice Sessions, Showing the Duration of the Learning Periods, Stages of Learning, Reports of Musical Decisions, Structure and PCs, and Dates of Public Performances.

Learning Period	Stage	Dates	Session	Duration (hr:min)	Reports
1	Reading/Exploring	12/05–06/06	1–20	21:54	1
	Deliberate Memorisation	13/06–26/06	21–33	13:03	2
	Interpretative "Big Picture"	27/06–29/06	34–36	2:45	3
	Interpretative "Big Picture	01/07	MC 1	0:53	
	Interpretative "Big	02/07–	37–41	3:50	

	Picture"	06/07			
	Interpretative "Big Picture"	07/07	MC 2	0:38	
	Preparing for Performance	08/07–18/07	42–48	5:88	4
		18/07	Performance 1		PC report 1
Break					
2	Revisiting the Piece	19/08–30/08	49–60	10:35	5
		30/08	Performance 2		PC report 2 & Structure report

As mentioned above, practice was divided into five learning stages, which will now be further discussed.

4.3.1 Learning Stages

Existing research on music practice and memorisation has established patterns in musicians' organisational approaches to the learning process. Different performers have reported similar practice stages (Chaffin & Imreh, 2001; Chaffin & Lisboa, 2008; Wicinski reported in Miklaszewski, 1989, p. 96; Soares, 2015). In this study, five stages of learning were identified based on my concurrent comments and retrospective analysis of practice: (1) Reading/Exploring; (2) Deliberate Memorisation; (3) Interpretative/Big Picture; (4) Preparing for Performance; (5) Revisiting the Piece.

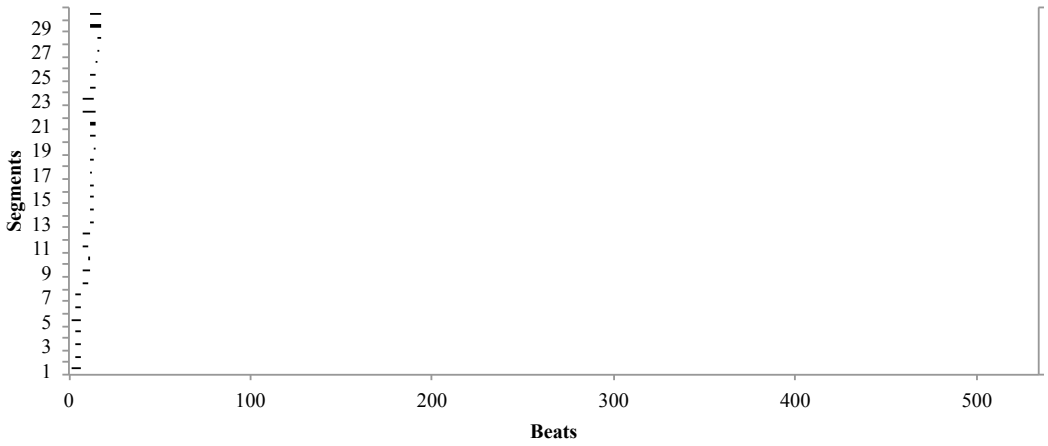
Stage 1 – Reading/Exploring (Sessions 1–20). When the composer delivered the music, my first approach was to look at the score and attempt to mentally form a general overview of the music. The complex writing and the use of extended techniques hindered my sight-reading. Preparing a piano is painstaking, as each note or harmonic to be played on the strings must be identified with a sticker before playing. Such thorough preparation becomes an obvious obstacle to a proper sight-reading of the piece.

The option available at the time was a notational overview, by analysing the score visually (Mishra, 2005). I did not use an aural overview (listening to recordings) because there was no aural model available at the time. Hearing the music in my head was also difficult to accomplish while analysing the score, because it was very hard to imagine the sound resulting from the passages performed with extended techniques.

The notational overview of the score provided a general idea of the tempo and technical difficulties to be faced but did not give a clear picture of the large-scale structure of the piece. For this reason, I worked on small segments to figure out the structure of the piece while reading through the music.

Practice at this stage targeted small segments of the piece. The first practice session was spent on only the first two systems of the score. These first systems are all based on glissandos, tremolos and harmonics on the strings (bar 1 and 2 – see Appendix 4). Twenty minutes were spent discovering how to perform these extended techniques. Figure 4 illustrates segments played during Session 1 (vertical axis) and the number of beats played for each segment (horizontal axis).

Figure 4. Practice Graph from Session 1.



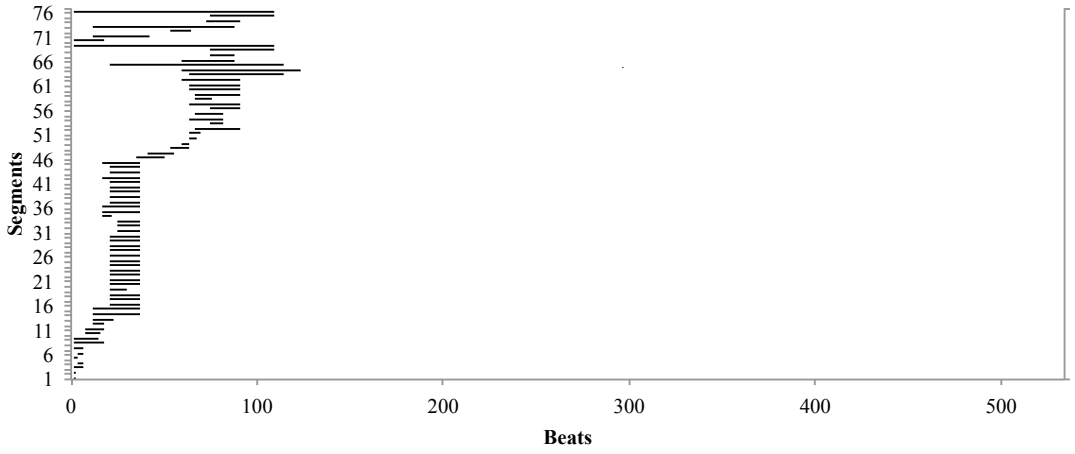
All practice sessions of the first learning stage followed a similar approach, gradually targeting small segments of the score, working forward through the piece until the end of the score was reached.

Stage 2 – Deliberate Memorisation (Sessions 21–35). After finishing reading the piece, I felt the need to start running it from beginning to end to see the big picture more clearly. However, I immediately found an obstacle to such approach. Because this piece requires the removal of the music stand, the score needs to be placed in alternative positions that often hamper turning pages while playing from beginning to end. Given the fast tempo of the piece, page turning became unmanageable. At the time, memorisation appeared to be the best solution.

Consequently, after Session 20, I deliberately decided to start memorising the music in small segments. The memorisation process combined repetition of difficult passages to develop kinaesthetic memory, together with the development of a conceptual representation of the piece with several references and cues to aid recall.

As with Imreh for her *Grey Stage*, synchronising mind and fingers was one of the main concerns (Chaffin et al., 2002, p. 133). Analysis of concurrent comments (detailed bellow) reveals that the majority of remarks on features later reported as PCs occurred at this stage. Practice graphs from this stage (Figure 5) show a combination of *segmented practice* (practice of small segments) with *integrated practice* (practice of larger sections combining the small segments).

Figure 5. Practice Graph from Session 21.



Stage 3 – Interpretative Big Picture (Sessions 36–41). This learning period was retrospectively labelled *Interpretative Big Picture* because, at this stage, the necessary conditions to develop an artistic image of the piece were finally achieved. After

memorising the music I scheduled two meetings with the composer to discuss interpretative ideas, because the premiere was approaching. In the first meeting I started by performing the piece by heart for the composer. What followed was a discussion on how to better communicate the story of the piece.

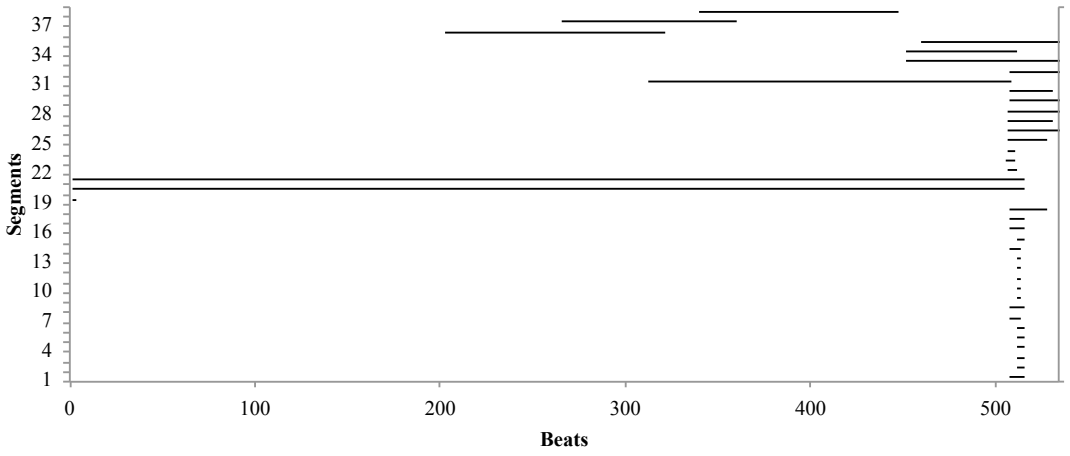
The composer advised me to bring out important melodies in the right hand related to the main theme of the piece from bar 27. I was very surprised, because I had not noticed that the chords in the right hand were a derivation of the main motif. I was so focused on the complexity of the left hand that I could not see what was musically important in that passage. This discussion was an important turning point because it changed my focus from the complexity of the piece to its artistic form.

We both agreed on the general spread of the energy throughout the piece and on a three-part structural plan. However, I also subdivided the piece into subsections, phrases and difficult passages that the composer had not thought about. Wynton actually mentioned not having a clear idea of structure at the time: “It’s hard for me to actually know the whole, how it is. I am still trying to hear it out” (Guess, 2015, collaborative meeting 2). The composer had not used a predefined formal structure to create the piece and he was still developing his own artistic image of it at this stage.

Although this learning stage focused on defining the big picture of the piece, practice continued focusing on memory consolidation and on synchronising mind with fingers. The main concern was to address the switch sequences present in this music.

The graph in Figure 6 illustrates practice at this stage. The final bars of the piece were persistently repeated. This final section is a clear example of the memorisation challenge described above related to the presence of several switches. The left hand is subdivided into varied patterns based on the same notes, but organised in slightly different manners.

Figure 6. Practice Graphs from Session 36.

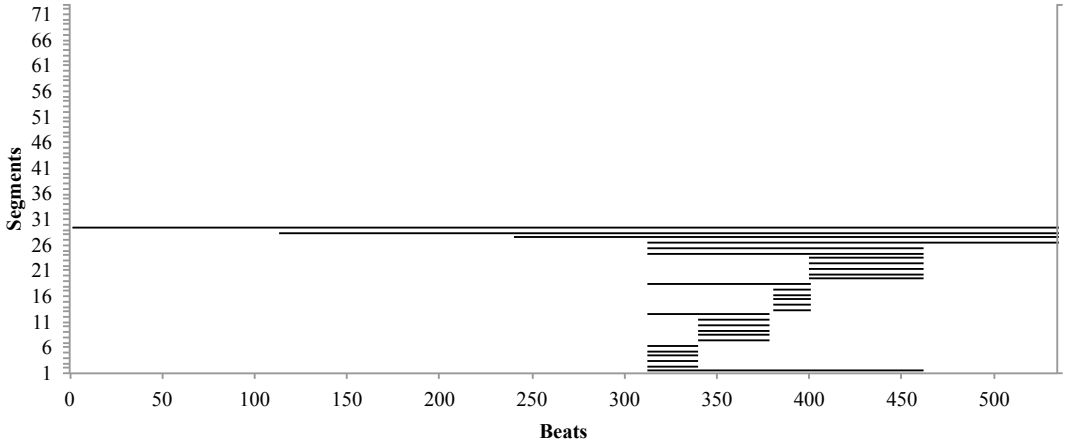


In summary, this stage was characterised by mental reflection on the big picture of the piece, together with hard work on consolidating memorisation of challenging sections.

Stage 4 – Preparing for Performance (Sessions 42–48) - The *preparing for performance* stage began with the following comment: "I feel that I have the piece from memory" (Practice Session (PS) 42). After accomplishing the great challenge of memorising the music, the main concern was to discover the best way to convey the story of the piece to the audience.

Similarly to Stage 2 and 3, the segmentation strategies at this stage alternated between *segmented* practice and *integrative* practice (see Figure 7).

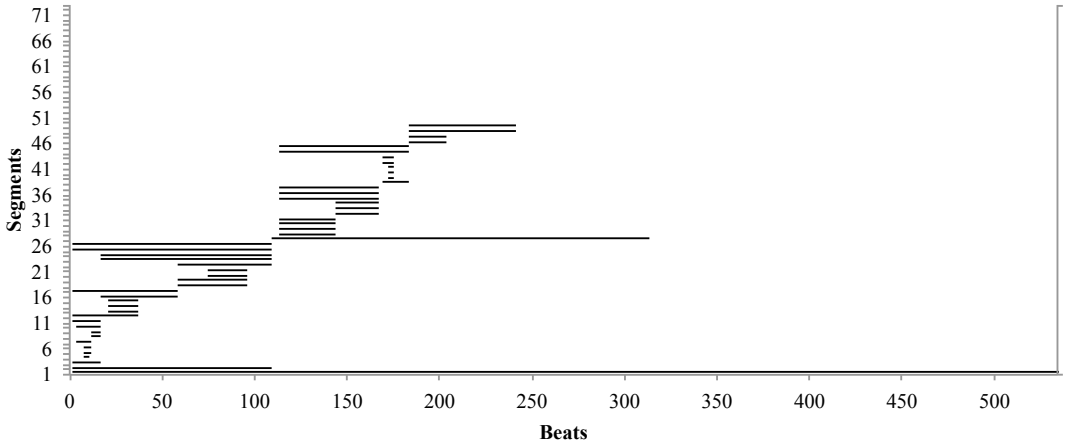
Figure 7. Practice Graph from Session 42 Illustrating a Combination of Segmented Practice with Integrated Practice.



During this stage, there was an increased focus on expressively communicating the story of the piece and on sound quality.

Stage 5 – Revisiting the Piece (Sessions 49–60). After the first performance of the piece and a one-month break, I spent one week revisiting the piece for a second performance. My first concern was to play through the piece and see how much I could remember. I was very surprised with the accuracy of my recall. I could remember almost everything. At this stage I focused on consolidating memory**,** work on technical difficulties and revise my interpretation of the piece.

Figure 8. Practice Graph from Session 51.



The practice graph in Figure 8 shows how practice strategies continued to use a combination of segmented and integrated practice. Analysis of practice graphs reveals that I never ran through the piece from beginning to the end until the performance. This is because I was aware that the grand piano I would play in the second performance would have a different soundboard organisation than the one I was practising on. I knew the importance of not creating a fixed visual memory of the location of the strings and decided to avoid repeating bars based on extended techniques. At the time I was confident that I could perform the piece well from beginning to end, so my main concern was to improve technical execution and expressive communication of the piece to the audience.

Summary and Discussion – Learning Stages

If You Were Here was memorised in a period of three months, in a total of 57.66 hours of practice spread over 60 sessions.

The time spent learning was much more condensed than the 10 months reported by Imreh (Chaffin et al., 2002), the 3.5 years reported by Lisboa (Chaffin et al., 2010) or the 4 years reported by Gerling (Chaffin et al., 2013). This is mainly due to performance constrains, as the two-month limit to learn the piece for the premiere was set from the moment I started reading the music. Moreover, I was forced to move on after the second performance to start preparing new repertoire for future commitments.

When comparing the learning time with previous studies, the number of hours in the first stage is higher than any total number of hours previously reported. The time spent reading (20 sessions) was surprising when compared with previous studies. By the end of session 8, Imreh had not only read through Bach's *Presto,* but was also able to play it by heart (Chaffin et al., 2002). Such a long reading period was unexpected for me, because I am usually able to read through baroque, classic and romantic repertoire very early in the learning process.

A possible explanation is related to task constraints, namely the difficulty of reading and performing for the first time a piece with complex language and unconventional performance practices, or to the knowledge brought to the task. The only piece for prepared piano that I had played before was George Crumb's

Makrokosmos Vol. II. Additionally, even though I have performed a wide range of non-tonal repertoire, this type of music does not have the clear unifying principles tonal music does. Each composer tends to develop his or her own language. At the time, I had never played Wynton's music and I had met him just a couple of months before. Therefore, a possible justification is that my limited knowledgebase in this context reduced the reading speed expected of a skilled musician. By approaching this music as a "novice", my encoding process was slower than predicted.

Deliberate memorisation also required a large number of hours for this piece. The same happened to Soares (2015, pp. 41-42) when memorising a short cadenza from Messiaens' *Oiseaux Exotiques*. The author suggested that the elevated number of hours could be explained by the features of the music (for example, language complexity, existence of varied textures and registers) or by the pianist's learning style. The same justification could be transferred to this situation. *If You Were Here* has polyphonic writing and explores a variety of textures and registers. The complexity is also transferred to the writing on the score, which often contains more than two staffs to represent the musical material (see Appendix 4, pp. 364-374) and requires a search for creative fingerings and hand positions. As a commissioned piece, all learning was based on individual exploration, without any additional information about its structure and language, or any support from existing aural models. Moreover, as a piece for prepared piano, the additional work of finding the notes on the strings may have contributed to the additional number of hours. Finally, the frequent use of switches in subsequent beats was an additional memorisation challenge, which not only slowed the process, but also almost made me think about not playing the piece by heart in the first performance.

The learning process was divided into five learning periods, which progressively changed from exploratory reading of the piece, to deliberate memorisation, to the artistic form of the piece, concluding with preparation of both performances. The learning stages fit within the three periods of preview, practice and overlearning proposed by Mishra in her *model of music memorization* (Mishra, 2005, p. 76). The first learning period began with a notational overview of the piece (*preview stage*) followed by detailed practice of different segments of the piece. In this study, the second learning period changed focus to deliberate memorisation. The third period concentrated on consolidating memory and developing interpretation, until I was able to perform the piece by heart confidently for the composer (*practice*

stage). In the fourth learning period, I engaged in overlearning of the music during a period of preparation for the first performance and, after a break of one month, the last learning period was spent revisiting the piece for the second performance (*overlearning stage*). The main difference in the learning stages in relation to Mishra's model and previous longitudinal case studies (Chaffin & Imreh, 2001; Chaffin & Lisboa, 2008; Chueke & Chaffin, 2016; Soares, 2015) regards the moment when the artistic image of the piece was formed. Because of the challenging features of the piece, it was not possible to form the artistic image of the music in the preview stage. I did attempt, but was not able to do so. Consequently, the conception of the big picture was gradually built while exploring the piece at the instrument.

The subsequent section will explore in more detail how focus changed throughout the learning process by analysing my concurrent and retrospective reports.

4.3.2 Reports

4.3.2.1 Annotations on score during practice

The scores annotated during practice were summarised in five reports and retrospectively analysed by: (1a) identifying different dimensions of the music in the annotations; (1b) grouping the dimensions into categories and (2) classifying annotations using the 12 dimensions identified (Table 4).

Table 4. Dimensions Identified in Annotated Scores During Practice.

Category	Dimension	Description
Basic	Fingering	Fingering decisions based on hand size, interpretative issues and expressive effects
	Rhythm	Counting and subdivision of complex rhythms
	Notes	Emphasis on specific notes to help execution of technical passages
	Patterns	Identification and labelling of patterns in the music
	Extended techniques	Execution of glissandos, tremolos or harmonics on the strings
	Positioning	Body position (sitting or standing) or hand position (open, closed)

Interpretative	Pedal	Placement of different types of pedals
	Dynamics	Dynamic levels
	Sound quality	Features of the sound to be reproduced (e.g., sweet sound)
Expressive	Change of character	Locations where the character should be changed
Structural	Structural boundaries	Starts and ends of sections, subsections or phrases
	Switches	Similar passages in the formal structure with slight differences

Annotations were considered basic if they denoted musical information implicit in the score (notes, rhythm, patterns) or actions required to merely play the notes (fingerings, playing of extended techniques or position of hands and body) (Chaffin & Imreh, 2001, p. 43; Ginsborg et al., 2006, p. 173). Interpretative categories referred to music features or performative actions requiring a subjective judgment. The important role of the pedal in producing sound effects led to several decisions regarding this dimension. Dynamics and sound quality were also considered interpretative, because they required subjective decisions on how they would be performed.

The expressive category refers to annotations related to communicative expression of the music story to the audience. Such annotations are located in certain places in the score that require an expressive effort from the performer to convey the change of character in the music. Finally, annotations related to structure indicate the beginning and end of different levels of structural organisation decided while reading through the piece, as well as particular features of the structure, such as the presence of switches.

Analysis of the total number of annotations for all reports reveals a sharp decrease from report 1 (n = 212) to report 5 (n = 79) (Figure 9). Consistent claims made in previous studies suggest that several dimensions become automatic, or are regrouped and reduced into smaller numbers to ease recall during performance (Chaffin et al., 2002; Soares, 2015).

Figure 9. Total Frequency of Annotations in the Different Reports Annotated during Practice.

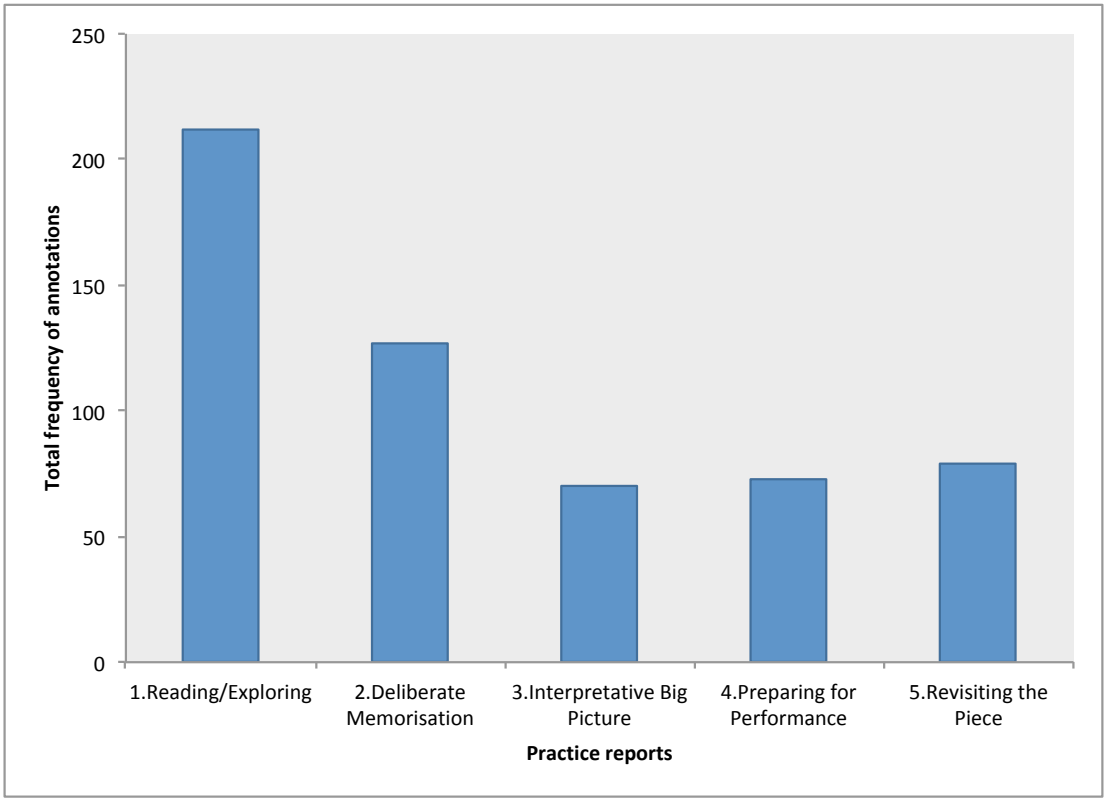
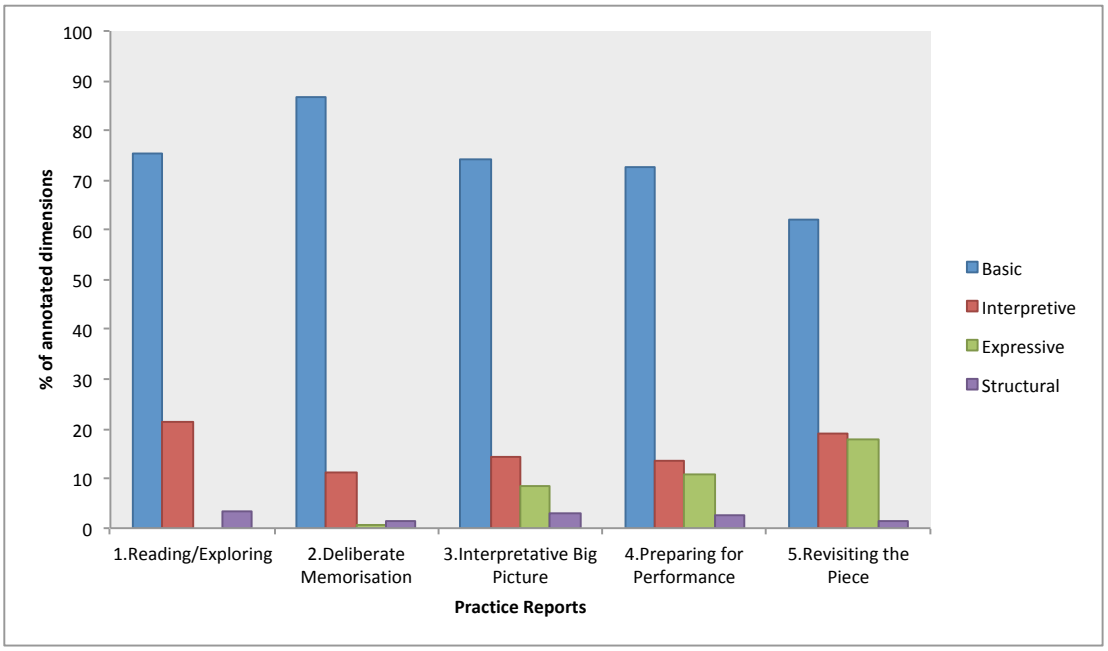


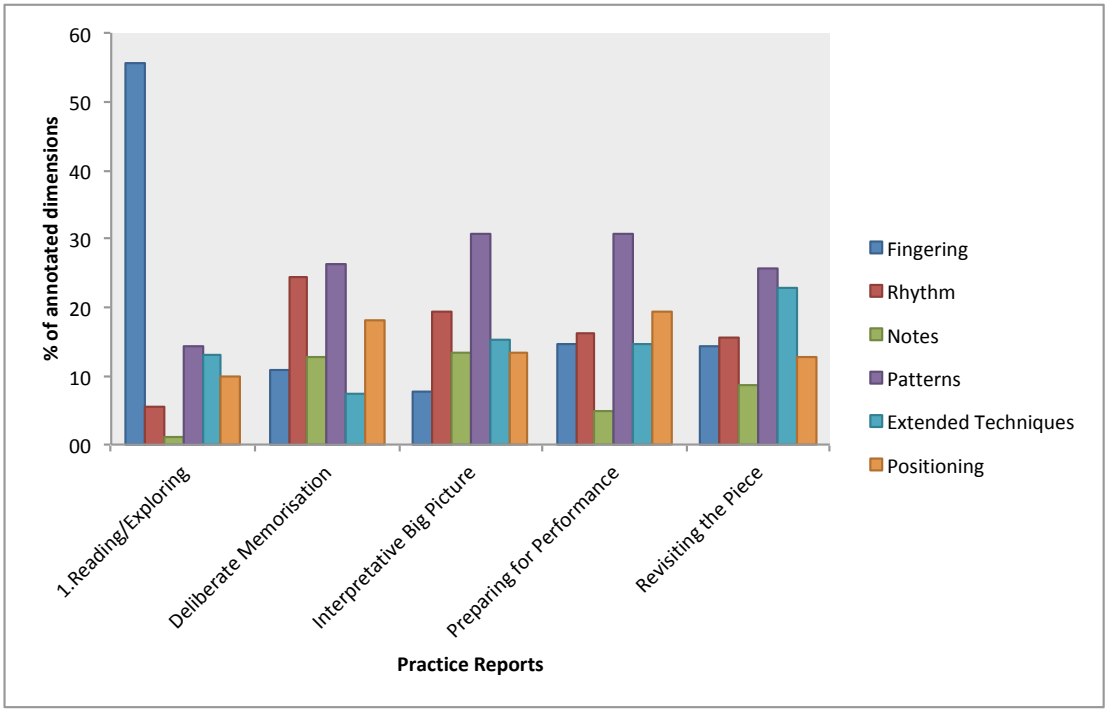
Figure 10 illustrates the change in categories of annotated dimensions across the learning periods. Because the total number of annotations varied greatly from period to period, frequencies were converted into percentages. Most annotations were on basic dimensions and interpretative remained constant throughout the process. Annotations on expressive features appeared later on in the process. Structural indications remained relatively stable throughout time, but were significantly fewer than other dimensions reported. This can be explained by the fewer locations requiring structural decisions when compared to other types of dimensions.

Figure 10. Graph Illustrating Change in Categories of Annotated Dimensions Across the Learning Period. Horizontal Axis Represents the Reports Annotated During Practice and the Correspondent Learning Stage and Vertical Axis the Percentage of Different Types of Categories Identified in the Reports.



Basic Annotations. Basic annotations were consistently high throughout the learning process, because they were related to unfamiliar motor actions and positions, which required practice throughout all learning periods. Moreover, basic features were also used as cues to aid memory during performance. It is interesting to notice the larger number of basic annotations in Report 2 (see Figure 10). A deeper analysis of changes in different types of basic dimensions can help understand why basic dimensions were an important focus of attention (see Figure 11).

Figure 11. Graph Illustrating Changes in Different Types of Basic Annotations Throughout the Learning Period.



Fingering was dominant in the reading stage, but declined drastically in subsequent reports. Such decrease emphasises the idea that decisions related to basic execution of the piece tend to become automatic with time (Chaffin et al., 2002).

Interestingly, this was not the case for extended techniques. Annotations for this dimension decreased during the deliberate memorisation stage and increased in the subsequent learning periods. This decrease can be explained by the lack of practice on grand pianos during this period (because I was practising mostly in my student residence and mainly had upright pianos at my disposal). However, I was not too worried about practising on grand pianos while memorising, because the extended techniques were memorised almost instantly.

Annotated decisions during the memorisation stage focused mainly on rhythm, patterns, notes and positioning. The first three types of music features were used as memory cues to avoid confusion in the switch sequences. Focus on these features during deliberate memorisation was expected, as coordinating motor actions with thoughts about memory cues required an extensive amount of practice at this stage. Body positioning and movement was also important throughout the learning process, because I had to decide how to move between the keyboard and the soundboard.

Interpretative, Expressive and Structural Annotations. Coming back to Figure 10 (p. 142), interpretative dimensions, which were focus of attention during the reading stage, decreased during memorisation and increased near the performance. Based on my experience as the subject of this study, this is a predictable result. Interpretative decisions about dynamics, pedaling or sound quality were important in the first reading, because I often associate technical decisions to my interpretation of musical elements. Attention to this dimension decreased during deliberate memorisation, because I was mainly concerned with overcoming memory difficulties. After completing the memorisation stage, I was again free to focus on interpreting the piece.

Expressive dimensions were nonexistent in the reading stage, because I could not find the big picture of the piece. My expressive ideas appeared mainly after memorising and being able to clearly see the artistic form.

The percentage of annotations on structural dimensions suggests that my final decisions on how to organise the music remained stable over time.

PCs During Performance. PCs were grouped into categories and sub-categories based on classifications developed in previous longitudinal case studies (Chaffin & Imreh, 2002; Chaffin & Lisboa, 2008; Ginsborg et al., 2006). When the reported thoughts did not fit within prevailing sub-categories, new types of PCs were proposed.

Table 5 identifies and describes the categories and sub-categories of PCs identified in both performances. Most PC types are similar to those found in previous studies. However, *extended techniques* and *positioning* have not previously been reported as PCs. These new sub-categories are closely related to the type of language and performance practices used in pieces for prepared piano.

Table 5. Categories and Sub-Categories of PCs Reported in Both Performances.

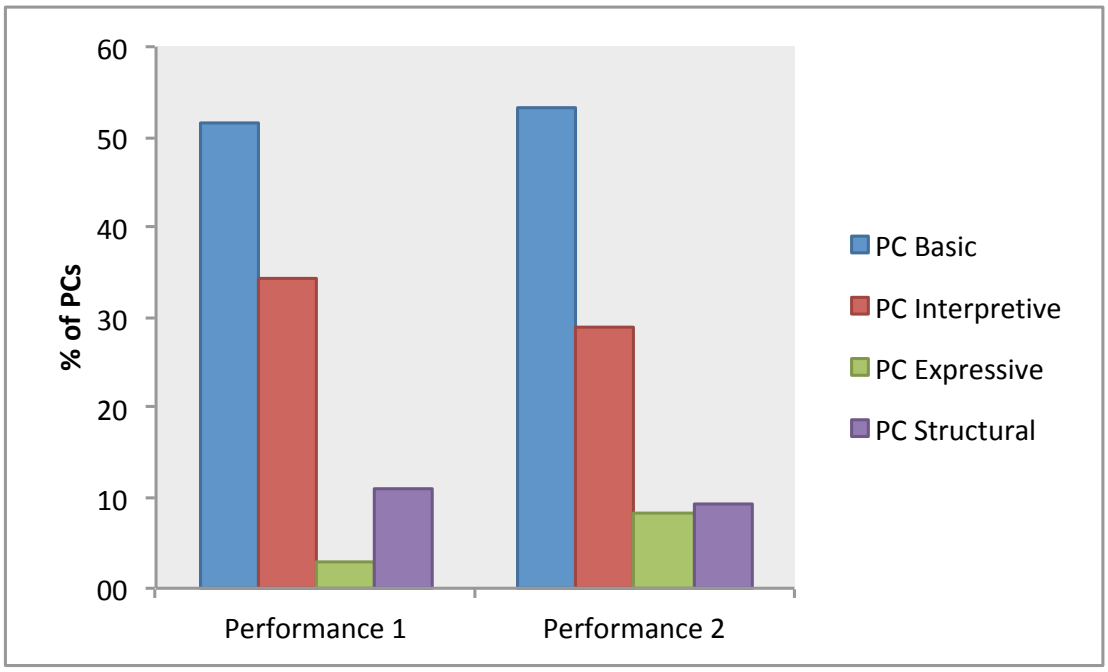
Categories	Sub-categories	Description
Basic	Notes	Thoughts on specific notes within a musical passage
	Rhythm	Counting of complex rhythms
	Fingering	Thoughts on specific fingers within a musical passage

	Extended techniques	Thoughts on glissandos, tremolos or harmonics used
	Positioning	Thoughts on body position (sitting or standing) and hand position (open, closed)
	Patterns	Thoughts on groups of notes chunked and labelled during practice
Interpretative	Pedal	Thoughts on where to place the pedal
	Dynamics	Thoughts on dynamic level
	Sound quality	Thoughts on the quality of the sound effects
	Articulation	Thoughts on how to articulate the notes (attacks, staccato, legato)
Expressive	Change of character	Thoughts on how to express changes in the music character
	Feeling	Thoughts on how to express feelings when playing the music motif (e.g.,, nostalgia)
Structural	Structural boundary	Thoughts on how the music is organised
	Switch	Thoughts about specific features of a similar passage with slight differences

The total number of PCs reported was large for both performances (n = 98; n = 107). The use of an elevated number of cues is in line with Chaffin, Demos & Crawford's (2009a, 2009b) suggestion that challenging music asks for more PCs. The majority of cues used to aid memory during performance were basic, corroborating results from previous longitudinal case studies of professional musicians (Chaffin, Demos, et al., 2009a, 2009b). The result is also in line with the elevated number of basic decisions reported in all annotated scores during practice. As mentioned before, basic features of the music such as patterns, notes and rhythms were used as cues to aid deliberate memorisation during practice and helped distinguish similar passages.

The percentage of different types of PCs is almost the same in both performances, with the exception of a slight decrease of interpretative PCs, giving raise to expressive PCs (Figure 12). As time progressed, some interpretative issues appeared to be replaced with more expressive concerns about how to communicate the story of the piece to the audience.

Figure 12. Percentage of Different Types of PCs in Performances 1 and 2.

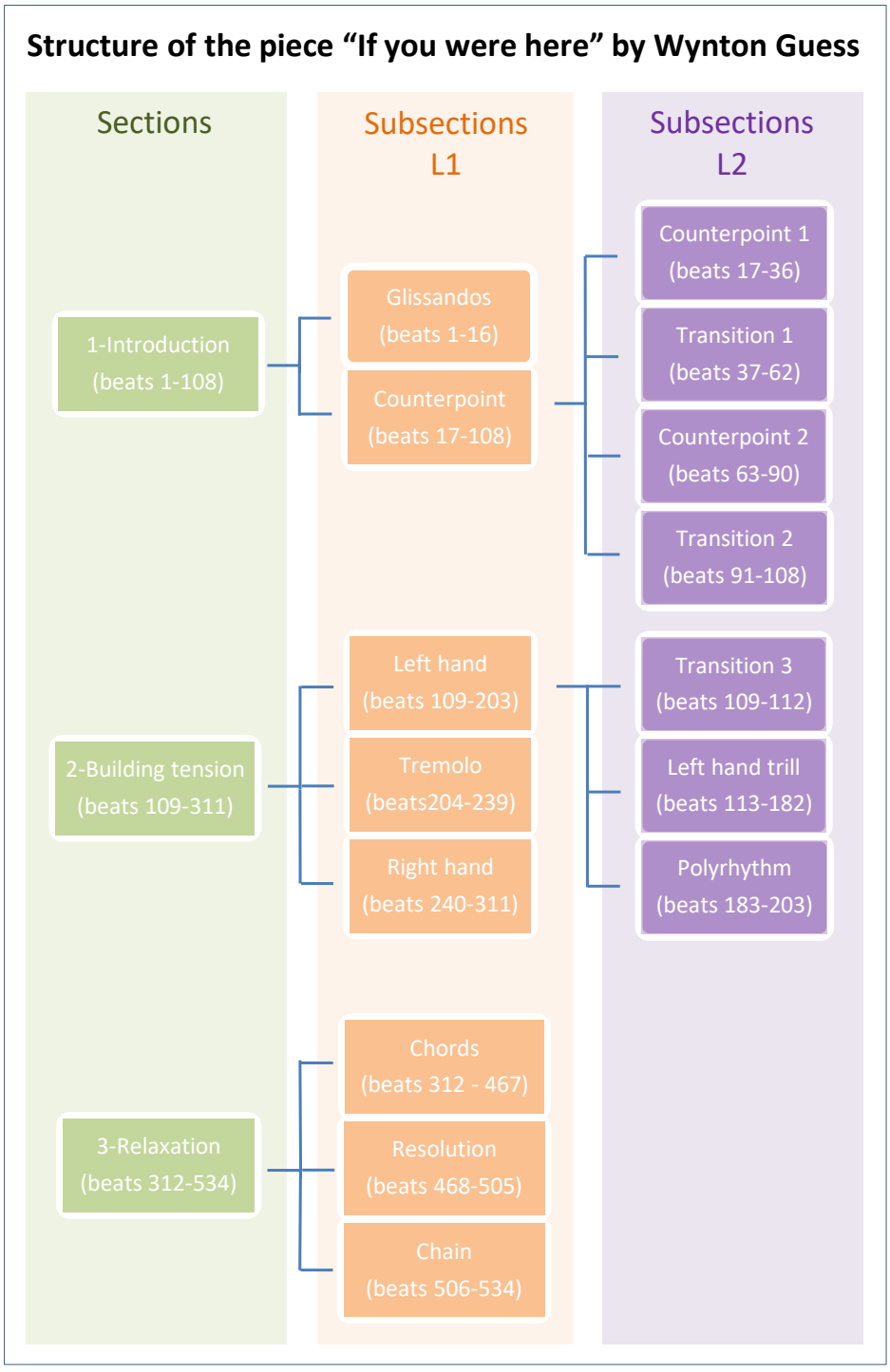


Reports on Structure. When preparing for memorised performance, musicians commonly use their understanding of the music's structure to guide their practice (Chaffin et al., 2002, 2010b; Chueke & Chaffin, 2016; Ginsborg & Chaffin, 2011a; Soares, 2015).

The piece examined in this study did not rely on standard structural forms and I was not familiar with how the composer structured the music. Nevertheless, I still felt a strong need to develop an understanding of the large-scale structure of the piece to guide my interpretation and practice. During the long reading period of 20 sessions, I intuitively searched for a structural organisation to hold on to during practice.

Figure 13 presents a diagram showing the final idea of structure retrospectively reported after the second performance. My understanding of structure is based on three hierarchical levels. The top level has three large sections representing the energy progression in the piece. The middle level represents the division of those sections into subsections based on specific musical features. Finally, the bottom level is a further dissection of the selected subsections into smaller segments.

Figure 13. Reported Structure of *If You Were Here* by Wynton Guess.



My understanding of the musical structure developed from the bottom up. The high complexity of the piece forced me to read very small segments at a time. While playing through those segments, I started intuitively finding some subsections.

In the first stages of learning, dissection of subsections was primarily based on specific difficulties. The labels assigned to subsections are mainly based on music features causing problems during the learning process. For example, subsections L2 "Counterpoint 1" and "Counterpoint 2" are based on complex polyphonic language. The "left-hand trill" is a subsection with a very difficult passage in the left hand resembling a trill. The "polyrhythm" section is a highly complex segment composed of polyrhythms.[22] The same type of division can be found for the majority of subsections in level 1 of the developed structure.

The high structural levels emerged only after having read through the piece. Those three sections are not based on difficulty, but on intuitive understanding of how the feelings of tension and relaxation develop throughout the piece.

4.3.2.2 Comments During Practice

In this study, concurrent verbal reports were analysed by transcribing the comments made to the camera in the video recordings. In total, 1211 comments were transcribed and divided into different topics following a content analysis protocol, in order to establish which musical aspects received the most comments throughout the learning process (Chaffin & Imreh, 2001).

After several readings of the transcript, 29 topics for comments were identified and allocated into 6 broader categories inspired by previous longitudinal case studies (Chaffin & Imreh, 2001; Ginsborg et al., 2006).

Table 6 presents the categories and topics used in the content analysis. Several topics correspond to categories used in describing the annotated scores. The meaning of basic, interpretative, expressive and structural categories was described above. The metacognitive category refers to plans and strategies applied in different sessions, to evaluations of their effectiveness, and to levels of concentration and energy during practice. Memorisation strategies and other topics related to memory were included in a separate category, because this topic received a large number of comments and because memorisation was the focus of this study.

[22] According to the *New Harvard Dictionary of Music*, polyrhythm "is the simultaneous use of two or more conflicting rhythms, that are not readily perceived as deriving from one another, or as simple manifestations of the same meter" (Randel, 1986, p. 646).

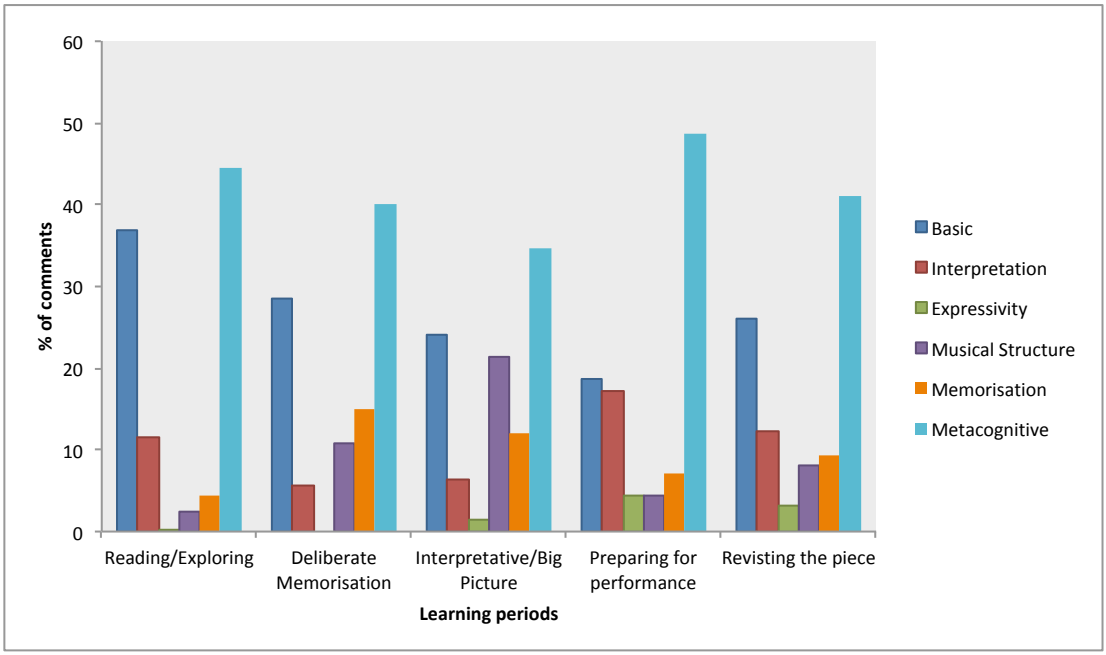
Table 6. Categories and Topics Used in Content Analysis.

Category	Topic	Example
Basic	Fingering	"I just realised that, at this speed, this fingering doesn't make sense."
	Rhythm	"Let's try to feel the rhythm without the metronome."
	Technical issues	"My fingers need to be super free and also my wrist. Now I am working on technique."
	Extended techniques	"I started by preparing the piano, finding a way to do the harmonics."
	Notes	"I know that on p. 6 I am working with two notes, D and E, and then p. 7 and 8 I will work with E, E flat, D, D flat, so five notes…"
	Body movement/Position	"In the last sections I need to have a better flow between the harmonics and playing on the keyboard. It is still not natural and it needs to look like a dance, a fluid movement."
	Articulation	"Ok, now staccato."
	Tempo	"Now I will just check if it's really this tempo."
	Instrument	"I will only have a grand piano this afternoon, so I will mainly review the passages on the keyboard."
	Patterns	"We have a pattern that starts on E and a pattern that starts on D."
Interpretation	Dynamics	"I need to start from nothing and do a gradual crescendo until the climax on bar 53."
	Pedal	"I will try to use different kinds of pedal, use the middle pedal or just half pedal, we will see which one is better."
	Phrasing	"I need to have a quick breath before starting this part. It will help with the phrasing."
	Sound quality	"I am looking for the sound I want, I want a ghostly sound."
	Voicing	"Bar 5, 6, 7 and 8 I will see as two separate voices."
	Composer vs performer	"I see it like this. I don't know how the composer sees it."
Expressivity	Expressive effects	"I need to express the idea that the piece will build tension and then relaxes until the section before the chain."
Musical structure	Musical structure	"Ok, so then I will start playing on the keyboard, so I will consider this one section…it's based on glissando and harmonics."
	Switches	"So here he does something similar, but he changes the

		rhythm."
Memorisation	Memory types	"I will memorise visually that my left hand needs to come to this note right next to the right hand and then the first black key here and then B."
	Memory cues	"Sometimes I get confused, so now I will try to be very focused and think about my cues, which are D flat and D natural."
	Memorisation goals	Ok, so today I will keep trying to memorise p. 4 and p. 5.
	Memorisation challenges	This is the worst part to memorise, I think. It's always changing.
	Remembering	Now I can see that I barely remember what I did yesterday. I need to do all over again.
Metacognitive	Learning progress	Ok, I feel that it is in now. I got the rhythm, the sense of the two voices.
	Evaluation	It's better, much better. Let's try from before.
	Energy levels	I am really tired. I will have to see this tomorrow.
	Concentration levels	I just realised that I was not focused, so I was doing the previous fingering.
	Difficulties	It's quite hard. Very complex rhythms happening at the same time.
	Strategies	I will practice really slowly, without pedal.
	Practice structure	I will focus today on the first and second sections.

Figure 14 indicates how the frequency of different categories of topic evolved as time progressed.

Figure 14. Percentage of Six Categories of Comments Across Five Stages of Practice.



As in most previous longitudinal case studies, the majority of comments in all learning periods were on metacognitive issues (Chaffin et al., 2002; Ginsborg et al., 2006). Basic topics were also frequent, as expected, in the first learning period. However, unlike previous studies, their percentage remains high in all stages of practice. This result corroborates the analysis of the annotated scores and supports the idea that several basic issues were crucial throughout the learning process. Interpretative topics are most frequently mentioned in the first stage of learning and the last two stages of preparation for both performances. As previously suggested, interpretative decisions were made from the start, decreased while the focus was on memorising and consolidating memory, and rose again close to performance.

Comments on structure gradually increased during the first three learning periods and reached the highest percentage of comments when the artistic image of the piece gained shape, decreasing after this milestone was finally achieved. Such a result supports the idea that structural understanding was gradually built while reading and memorising the piece. After the big picture was formed, the problem of identifying the musical structure was solved and the number of comments on the subject decreased.

As expected, comments on memorisation were more frequent during the deliberate memorisation and interpretative/big picture stages, while memory of the

piece was being developed and reinforced. Nevertheless, memorisation also received some comments during the first period. The memory challenges of the piece were assessed very early in the learning process. Moreover, there was an early attempt to think about effective strategies to tackle the difficulties identified.

Comments on expressive dimensions followed a similar trend to those of previous studies, increasing in the final learning periods. The settlement of technical and memory difficulties provided additional freedom to focus on expressive communication with the audience.

Metacognitive topics. Previous studies on memorisation with professional musicians have reported elevated numbers of metacognitive comments during practice (Chaffin et al., 2002; Ginsborg et al., 2006). This study was no exception, as this category received the highest percentage of comments throughout all learning periods.

Comments on this subject illustrate different types of metacognition [23] identified by Colombo and Antonietti (2017). The majority of comments represent *metacognitive control* or *metastrategic knowledge*, i.e., "knowledge about strategies and their effective use" (Colombo & Antonietti, 2017, p. 95). Metacognitive control was frequently revealed in remarks on how to structure practice, on identification of potential difficulties and on strategies to cope with the challenges.

As a newly commissioned piece, *If You Were Here* was unknown territory in the first stages of practice. Consequently, the organisational approach to practice was quite exploratory at first. Comments on practice organisation in the first learning period suggest the use of score layout to segment the piece for practice. For example, in session 5 I mentioned working on specific systems: "Now I will work system by system, until the music gets into my fingers" (PS 5). One session later, I decided to work in larger segments by targeting different pages of the score: "I will just try to play both pages together and then I will stop" (PS 6).

Very complex passages were handled by targeting very small segments one at a time: "This passage is quite complex, so I have to do bar by bar, until I understand completely" (PS 2). Deconstruction strategies are very popular in domains such as computational sciences. Frequently known as "divide and conquer", these strategies

[23] Metacognition relates to the ability to understand how one learns, to assess potential difficulties in a task, to monitor understanding of the task, to use existing information to accomplish a goal and to assess the learning progress (Flavell, 1979).

consist of dividing a problem into subproblems and conquering each subproblem individually (Riley & Hunt, 2014).

Piano topography was sometimes used as a criterion to structure practice. For example, in session 2 I decided to perform only sections on the keyboard to protect my fingers from playing on the strings: "So, today, I will start by playing on the keyboard. My fingers are hurting because I am not used to play on the strings, so I will start with this part on the keyboard" (PS 2).

As time progressed, comments on score layout or piano topography gradually gave rise to sections and subsections. According to my comments, the first time I deliberately used structural meaning to organise practice was in session 16: "Today I will work on section number 3, where I have the left hand. I will try to automate the movements" (PS 16). In the first sessions of the second learning period, I reported working mostly on subsections individually, but as time progressed the small segments were integrated into larger sections: "I will play both tremolo subsection and left hand subsection" (PS 40).

The work on specific parts of the piece usually started with a scan of potential problems. In the first learning period, several comments refer to the level of difficulty of specific passages: "I think this is one of the worst parts of the piece, because there are many things happening at the same time: pedal, rhythms at the same time" (PS 4). The identification of prospective challenges was often assisted by musical analysis: "So, before I start playing, I am analysing the score and I am noticing that every time I have a slur the pattern changes. This will be difficult" (PS 18).

After recognising impending difficulties, the next step was to devise a set of problem-solving strategies. Technical difficulties were often sorted by playing separate hands or through slow practice, with support from the metronome.

When certain tasks became overwhelming, goal setting was used to gradually cope with different challenges. This strategy has been considered a central feature of effective practice (Lehmann & Ericsson, 1997). I used goal setting to accomplish different aims established for this piece. For example, when working on accuracy, the goal was to play a targeted number of times with no mistakes: "I will try to do this passage ten times without failing" (PS 4). When working on improving speed, the goal was to gradually reach the target tempo with support from the metronome: "I will increase speed with the metronome. I am slowly increasing the tempo – each

time I play I raise the tempo by 5. Right now I am playing with a crotchet beat at 55 and I need to get to 73" (PS 10).

The very fast "trill" in the left hand from page 2 to page 9 presented technical challenges. My basic approach was to practice slowly, with a stepwise increase in tempo as confidence progressed. Practice at a slow tempo went beyond hollow repetition, including a set of techniques to develop effective automatisation of the movements. Fast sequences were practised by playing "fortissimo and accentuating the first beat" (PS 9). This strategy aimed at focusing on the movement of the fingers throughout the sequence and on feeling how the movement progressed in each subsequent beat. Some passages were also practised with "dotted rhythms" (PS 16). Essentially, instead of increasing speed at once in the entire sequence, the dotted rhythms concentrate the fast playing on specific notes.

Several metacognitive comments also reveal continuous monitoring of the learning process and the effectiveness of the strategies employed. Colombo & Antonietti (2017) identify this type of metacognition as "metacognitive monitoring". After attempting to solve a specific challenge I would usually comment on the state of progress:

> Ok, I got the sense of the rhythm. It's not very fast. I just need to rest a little bit. Now I understand where the notes are. This passage needs to be natural, easy to play, and right now it seems that I am counting each note like a mathematician (PS 2).

The quality of practice was also always under evaluation. In the first learning period, evaluations were mostly negative. Sometimes I would criticise my performance of certain musical features: "I didn't like the rhythm in the second page" (PS 14). At other times I would just assume that my plans and strategies were not working: "This is not going well [frustrated]" (PS 16). However, as time progressed and confidence increased, practice evaluations became more positive: "Ok, I think the left-hand section is getting much, much better now" (PS 40).

Metacognitive monitoring was also revealed in comments on concentration and energy levels. Several comments illustrate my struggle to concentrate properly while playing through the piece until very late in the practice process: "It's better, but I still have a hard time focusing. What I need to work now is on my concentration throughout the piece" (PS 43). Usually after examining my concentration or energy levels I would devise a new practice plan, thus suggesting that the metacognitive

knowledge of my own reactions and needs was used to monitor the course of practice.

The high percentage and variety of metacognitive comments supports Hallam's (2001) argument that metacognition plays a vital role in musicians' practice. As in previous studies, metacognitive skills were also demonstrated in relation to memorisation (Chaffin et al., 2002; Hallam, 1997), but will be described in a separate section because of the high relevance to this study.

Memorisation Topics. Memorisation was a frequent topic of comment throughout the learning process. The first remark on memorisation emerged in the very first session, while discovering the location of the harmonics on the piano strings: "I need to memorise the position of the harmonic" (PS 1). The performance of harmonics inside the piano soundboard requires extensive stretching of the body to reach the middle position of the strings. Sometimes, because of my short height, I was forced to almost lie down over the strings to perform the harmonics. Such body stretching did not allow direct eye contact with the score, thus forcing memorisation of extended techniques very early in the learning process.

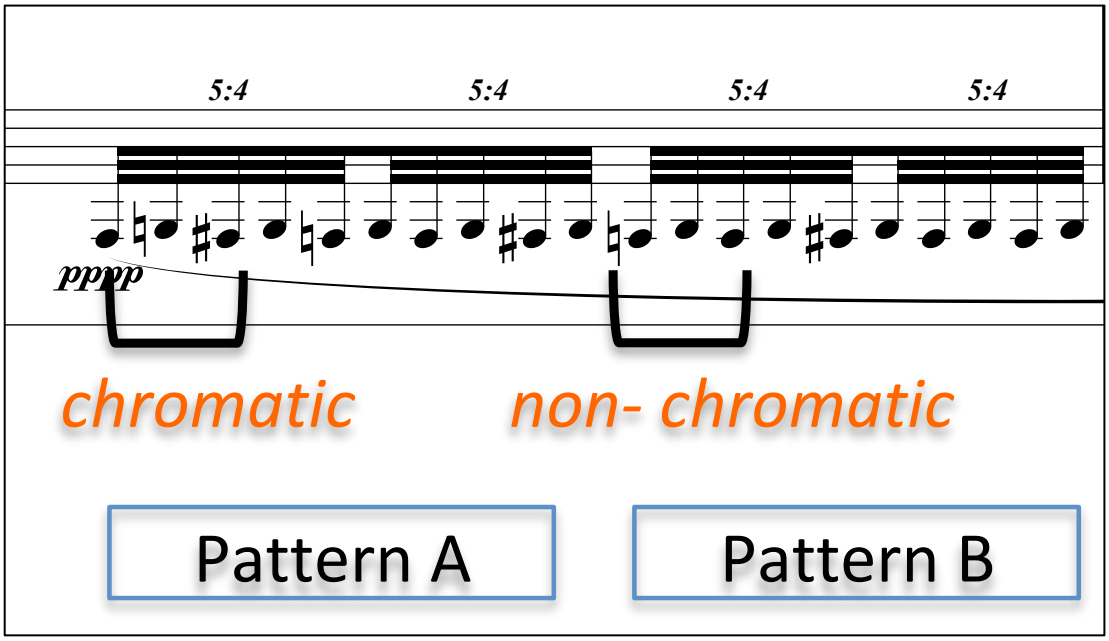
Nevertheless, this was not the case for the music sections performed on the keyboard. Several comments on memorisation refer to specific memory difficulties faced in different parts of the piece. When first noticing the existence of similar subsections with small differences (switches), the first reaction was: "This will be really hard to memorise" (PS 2). The frustration increased when realising that some sequences had little switches in every beat (switch sequences, see subsection 4.1.3). In session 22, I commented on the high level of complexity of these passages: "This is the worst part to memorise, I think. It's always changing" (PS 22).

My initial response was to consider such sequences impossible to memorise and to consider using the score in performance. However, the need to start memorising arose when practical issues, such as page turning, were hindering a successful performance of the piece. In session 19, I included memorisation in my practice goals for the first time: "The next step will be to work on each section very well and try to start memorising, because I have trouble turning the pages, so if I find a way to memorise this it will be better for me" (PS 19).

The initial approach was to memorise small segments of the piece following a stepwise approach from the beginning to end. This divide and conquer strategy was

also used to memorise the challenging switch sequences by targeting one beat at a time. First, I analysed the sequence and attempted to chunk the different notes into patterns. The chunking process began in the reading stage, but memorisation asked for a more in-depth analysis of the chunks. When memorising the left hand of bars 27 to 33 I commented: "I will try to find a way to memorise these patterns [analysed the score]. So, I will divide it in two groups [wrote in the score]. In the first group this is chromatic and the second group is not chromatic and in the end is always A sharp" (PS 22). The chunking strategy was based on previous knowledge of intervallic cues, such as presence or absence of chromatic intervals (Figure 15).

Figure 15. Example of Patterns Identified in Bar 27.



The grouping of different motifs based on the identification and connection of intervals was a vital strategy during encoding and retrieval of these sequences. The subsequent step was to combine the conceptual representation of the patterns identified with other memory types. Due to the fast speed, kinaesthetic memory was considered crucial in this case:

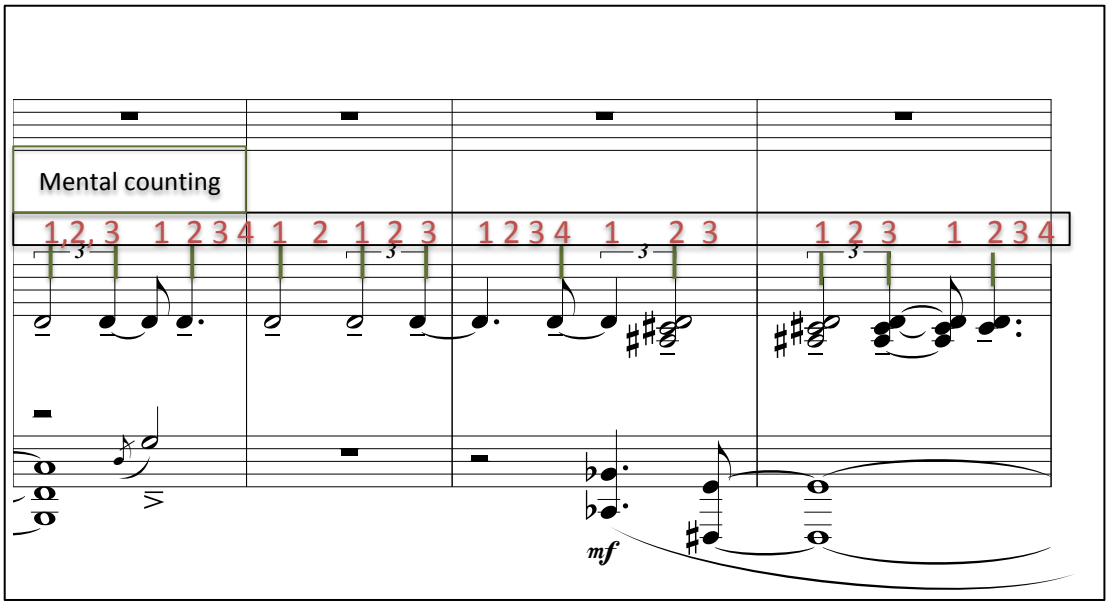
> What I am trying here is to memorise…to understand the pattern, but at the same time in a motor way, because it's too fast for me to look and to create a visual representation. So I think that motor memory is really important here. I understood the pattern and I am counting in my head, but mostly I am working on motor memory here. (PS 22)

From my personal experience, the best way to develop kinaesthetic memory is through persistent repetition and through different exercises described in the subsection above. The major challenge was to match automatic movements of the fingers with thoughts about the identified patterns. I commented on this problem in session 38: "I think that the trick here is really a combination of a very good motor memory with quick thinking of what is happening in each pattern" (PS 38).

The solution was to plan very carefully what to think about when performing these sequences: "This is what I will think during performance: 'A-B, A-B, A-B and right hand'" (PS 22). A and B were the tags assigned to the main chunks of the switch sequence in the "left hand" subsection. Because there was no tonal pattern immediately available to evoke these chunks, I assigned new tags to the different groupings. Sometimes when practising the patterns I would verbalise their tags. The verbalised thoughts are very similar to the ones written on the PC reports filled in after both performances of the piece, suggesting that PCs were carefully prepared during practice (Chaffin et al., 2010; Chaffin & Imreh, 2002).

The synchronisation of mental thoughts with finger movements was also applied to sequences with the same notes organised into different rhythms. I commented on the difficult of these sequences in session 30: "The problem here is to do the rhythm right because it's always changing" (PS 30). This specific challenge was a source of frustration at this stage. The solution found was to develop mental counting sequences, based on rhythmic subdivision. Practice of these sequences involved counting out loud the rhythmic subdivision, while coordinating the movement of the fingers. Figure 16 illustrates an example of such sequence. The numbers represent my mental counting, while vertical lines designate where the finger should strike the key during the counting sequence.

Figure 16. Mental Counting Sequence Developed to Keep Track of the Changing Rhythms in the Piece.

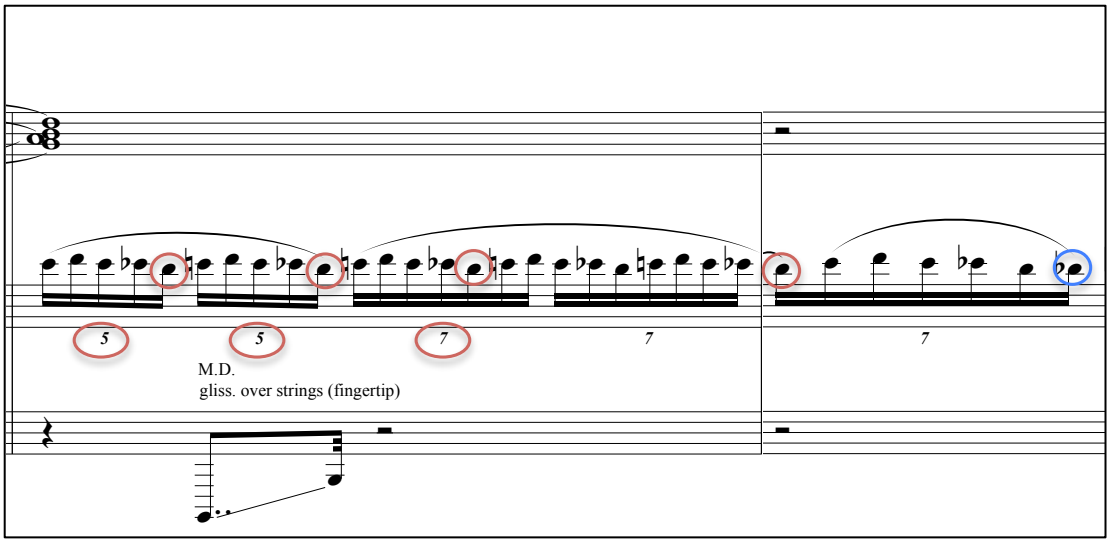


On some occasions, the development of sequences of patterns or rhythmic groupings was not straightforward. This was the case of the "right hand" subsection. I commented on the additional challenge of this passage in session 38:

> This is the worst part, because it's very fast and the patterns are not organised in a logical sequence. We have the same notes, but I think they are randomly organised and this is so fast that is very hard to think. (PS 38)

Because labelling of different chunks was not effective for this section, several types of cues were developed to distinguish different groupings. In the first stage of learning I noticed that some chunks had the note D and others the note D flat. Additionally, some were quintuplets, others septuplets: "So I have groups with D natural or with D flat and I have sets of five notes and sets of seven notes" (PS 18). Later, in session 46, I identified these notes and rhythms as my memory cues for this subsection: "Sometimes I get confused, so now I will try to be very focused and think about my cues, which are D flat and D natural, and quintuplets and septuplets" (PS 46). I was aware that these cues were crucial to keep track of my memory during performance. I commented on their relevance in session 60: "I am thinking about my mental cues, which will help me with my memory during performance" (PS 60). Figure 17 illustrates which notes served as cues to distinguish the similar groupings.

Figure 17. Example of Notes and Rhythmic Groupings Used as Cues to Help Distinguish the Different Beats in the "Right Hand" Subsection.



The development of memory cues was a strategy used for all subsections in the piece and depended on the features of specific passages. Sometimes fingering was used as a cue as a reminder of a change of hand position: "I will memorise this [beat 189, left hand] with the fingering. I know that after this I need to change to the fifth finger and change the position of the hand there" (PS 27).

Visual representation of the keyboard and hand shapes were also frequently used to aid memorisation. For example, when reading a chord on bar 26 I noticed:

> Memorising this chord will be easy [beat 109]. So, it's down on the keyboard, so I will just remember that the C is out, so every note except C. I am not remembering the name of the chord, but the visual representation of it (PS 4).

In the "tremolo subsection" I also used visual representation of hand shapes and their position on the keyboard to aid memorisation. Because the rapid tremolo movements hindered the visualisation of the hand and piano shapes, I used a strategy known as *blocking,* which consists of isolating and performing simultaneously notes associated to specific hand positions or harmonic patterns, even though they are meant to be played in isolation in the final performance (Nellons, 1974, p. 3).

Visual cues were also used to support memorisation of the polyphonic subsections ("counterpoint 1" and "counterpoint 2"). Some comments in session 21 illustrate attempts to visualise the hand position on the keyboard while memorising the subsection "counterpoint 1": "Ok, so these chromatic notes will come after G

sharp [bar 7]. So what I am doing is a mix of trying to memorise the notes with visual memory of the keys" (PS 21).

Memorisation of polyphonic sections also included strategies based on auditory memory development. Performance of polyphonic piano music usually requires simultaneous playing of diverse melodic lines using the same hand. This presents a memorisation challenge, because the pianist is kinesthetically processing the melodic lines simultaneously, while trying to conceptualise and listen for each voice individually. The strategy I had previously developed for memorising polyphonic piano music such as J.S. Bach's fugues is to sing separately each melodic line to develop aural memory of each voice. After working on each line independently, I would usually sing one melodic line while simultaneously playing the others. I applied the same strategy to *If You Were Here*:

> I usually tend to neglect the middle voice in polyphonic works, so what I usually do is to sing it with the name of the notes. By singing I will ear more properly how they sound and it will help internalise the melodic line (PS 21).

The effectiveness of the different memorisation strategies employed was often monitored through examination of levels of remembering. Interestingly, remarks on how much I remembered the sections played on the soundboard are quite different from the ones on the keyboard. I was often surprised by how easily I could remember the extended techniques performed on the soundboard: "I didn't practice for four days this part [first subsection, 'extended techniques'] but as I was marking the harmonics I remembered straight away. This is easy to remember" (PS 13).

As mentioned previously, remembering did not come as easily for the sections on the keyboard. In the first stages of encoding I commented: "Now I can see that I barely remember what I did yesterday. I need to do all over again" (PS8). When memorising the polyphonic sections I also noticed how difficult it was to remember the individual voices: "I had no idea of the left hand. This is the danger of playing different voices, because then you just rely on the vertical line and on motor memory. So, I have no idea about this voice" (PS 21).

Sometimes, deliberate memorisation was inefficient, particularly when the level of focus was low. For example, my first attempt to memorise the subsection "polyrhythms" completely failed: "I tried to memorise this the other day, but I can't remember anything. I remember I was tired, not concentrated, so it didn't work" (PS 26).

Although comments on remembering became more and more positive as time progressed, the right hand subsection was usually confused until very late in the learning process. Some weeks before the first performance, I mentioned difficulties in remembering correctly the right hand subsection: "Yesterday I started confusing some passages in this section when playing from memory, so I will try to solve this problem" (PS 39). While working on this section I continued commenting on memory problems: "Now I am confusing the last part of p. 8. It is very hard to not mix the D flats with the D naturals" (PS 39).

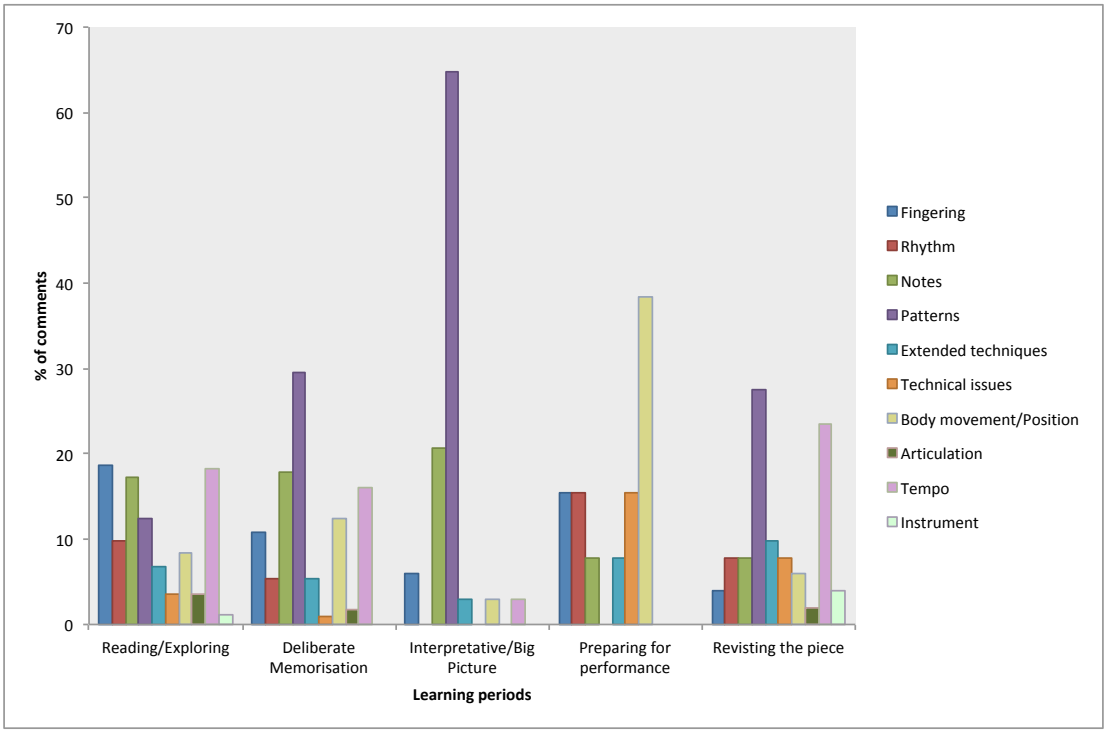
Unfortunately, the intensive memory work on the right hand section of *If You Were Here* was not enough to avoid a minor memory lapse in the premiere of the piece. While performing the right hand subsection I confused one of the groupings, but fortunately recovered immediately and jumped to the subsequent group. The extensive practice of performance cues in this passage allowed me to recover from the memory slip by jumping ahead, but was not enough to avoid the minor lapse in the first performance.

This memory slip was a cause of concern when revisiting the piece in the last learning period. After reinforcing memory of this subsection I finally felt that the problem was sorted out before the second performance: "Ok, I think the right hand section is getting quite secure in terms of memory" (PS 56). The second performance from memory was very secure, with no memory failure, revealing that memory reinforcement in the last learning period had paid off.

Basic Topics. Comments on basic features received the second highest percentage throughout all learning periods. Clearly, basic issues were a focus of attention from the first reading to the final performance. An in-depth analysis of the different types of basic comments can further explain this result.

Figure 18 represents the percentage of different types of basic comments for the five learning periods. Elementary issues related to the type of instrument used in practice (grand or upright piano) or to basic aspects of articulation (staccato or legato) received very low percentages of comments and will not be discussed further. Nevertheless, other basic issues were topics of comment while reading and memorising the piece and will be explored in detail below.

Figure 18. Percentage of Different Types of Basic Comments Across Five Stages of Practice.



Fingering. Fingering received the highest percentage of comments in the first learning period. As was wisely claimed by Frederick Chopin, "everything is a matter of knowing good fingering" (Chopin, n.d., In Verbalis, 2012, p. 3). This premise accompanies me in every reading of a new piece and Wynton Guess's music is no exception. In the first reading stages, one of my main concerns was to establish appropriate fingerings. My decisions were based on an array of factors, among which were technical, interpretative, expressive and performative (Chaffin et al., 2002; Pipa, 1992, 2013). When approaching the extended techniques, decisions were based on the resulting sound effect: "with the second finger [bar 2, beat 11] I get the sound I want" (PS 1).

I decided fingerings very early on and avoided changing decisions as much as possible, to circumvent possible interferences with kinaesthetic memory. There was a constant attempt to understand whether the chosen fingerings could be performed in the final tempo: "[This fingering] might be better in this tempo" (PS 8). Additionally, because the piece requires performance at a fast speed, the use of consistent fingerings for repeated patterns was a major concern: "I will use the same fingering on the septuplets" [bars 71–72] (PS 10).

As mentioned before, fingering was also used as a cue to remember the position of specific patterns: “Very important here is finger number 2 [bar 33] to remember that I have to change the position of the hand in this pattern” (PS 22). This specific fingering was a frequent topic of comment during practice and reported as a basic PC in both performance reports.

During the final stages of preparation for the first performance, comments on fingering were mainly related to the climax of the piece (bar 53). Although I avoided changing fingerings as much as possible, in this case I considered that a different fingering would result in a more effective sound. This is why fingering had an elevated percentage of comments during the fourth learning period (see Figure 18).

Tempo. Tempo received the second highest percentage of comments in the first learning period. In the first stages of reading I analysed the score to look for the composer’s tempo marks. The metronome was often used to get the feeling of the final tempo: “For now I will play with the metronome and try to understand the tempo marked by the composer” (PS 6).

This music feature was often targeted as a practice goal. In session 6 my main goal was to play as close as possible to the tempo marked by the composer: “Today my goal will be to do correctly at 50. It’s close to tempo. And then tomorrow I will try to play at 60” (PS 6). Moreover, tempo also influenced other basic decisions. For example, in Session 2 I mentioned that a specific fingering decision “depends if the tempo is slower or faster” (PS 2).

This topic continued to receive remarks in the second learning period. Comments at this stage mainly focused on the difficulties faced when playing the challenging switch sequences in the right tempo: “It’s really hard to do this in tempo” (PS 27). Sometimes I also commented on the difficulties of coordinating fingers and mind in the final tempo: “Ok, so for now I need to study at this speed. Sixty is still too fast for me to control what I am thinking and what I am counting. For now, I am doing 50” (PS 27). Because this coordination was so challenging, I practised the switch sequences under tempo to make sure the coordination was effective. In the interpretative/big picture period, the number of comments on this topic decreased sharply, as I was mainly concerned with developing a general idea of the piece and on consolidating memory of the most difficult passages. The comments about this topic

in the last stages of practice are mainly based on attempts to monitor the speed and confirm that I was playing at the proper tempo.

Rhythm. In the first learning stages, several comments were related to rhythmic subdivision to aid the performance of polyrhythms. Rhythmic subdivision was found to be the more effective solution for this specific problem. In Session 8 I explain how I was subdividing the rhythms: "I am thinking in eight notes. It's better for me to understand the rhythm" (PS 8). Additionally, several comments refer to decisions on how to mentally count the rhythms: "In bar 30 I will count '1, 2, 3, 4', '1, 2, 3, 4', '1, 2'" (PS 23). Counting was also practised for sequences repeating the same note with changing rhythms, as detailed above.

Notes. In the reading stages of the piece, notes were a frequent topic of comment. The first concern was to understand the notes in the score, to identify their location on the keyboard and soundboard and to listen to the resulting sound. I was particularly focused on the notes related to extended techniques, whose writing I was less familiar with: "I need to figure out this harmonic. So, the composer writes B flat, search node for the fifth partial harmonic. But I know that the note that will sound will be different. Probably the fifth? F?" (PS 1).

One could expect that after figuring out all the notes, they would stop being mentioned in practice. Interestingly this was not the case, as the percentage of comments on notes gradually increased until the third learning period. This is because the focus on notes changed from a simple understanding of their location and sound to their use as memory cues. In Session 21, when memorising the beginning of the piece, I identified which notes I would consider as cues: "So the first notes I need to use as cues are E and G. I will think in Portuguese because it's easier for me. So, mi, sol, with both hands". As mentioned before, other notes were also singled out to help memorise the challenging right hand subsection (Figure 17). Several notes used as cues during the memorisation stages were highlighted in the majority of practice and PC reports.

Patterns. The strategy of chunking notes into patterns was frequently used to avoid cognitive overload when processing the switch sequences. Therefore, the elevated

percentage of comments on patterns while memory was being developed and reinforced is not surprising.

The exploration of these chunks started early in the learning progress. While reading through page 2, I commented: “I just discovered that in the last system of p. 2 we have different patterns. One starts with two notes A, two white keys, and the other is chromatic. I will have that into consideration later on” (PS 12).

Comments on this topic continued during deliberate memorisation of the piece, as they became essential when memorising the switch sequences (see subsection *Memorisation topics*).

The patterns of the final switch sequence of the piece were frequent topic of comment during the third learning period, because their similarity created several memory problems that were only resolved near the first performance. Remarks on this sequence returned when I was revisiting the piece in the last learning stage, because I decided to review carefully the different features of the patterns: “Let’s remember the specific features of each pattern” (PS 53).

Extended Techniques. Comments on extended techniques mainly relate to the basic actions required to perform techniques on the soundboard, such as pizzicatos or tremolos on the strings. For example, in Session 1, I mentioned how to perform a harmonic: “In the middle part of the string, with this position of the finger I can play the harmonic” (PS 1). The performance of extended techniques also requires decisions about how to identify the location of the notes and harmonics on the soundboard. In Session 13, I spent the first part of the session developing a new method to label the harmonics on the strings: “In this practice session, I am starting by preparing the piano and to find a new way to label the harmonics. I think I will place a sticker on the harmonic location. Let’s see if this will work” (PS 13). The performance of extended techniques was always challenging because, as mentioned above, different piano brands have different soundboard layouts. For example, in some brands, the soundboard had bars in the middle of the glissandos, hindering a proper performance of these techniques. I commented on this difficulty in the very first session: “I have a bar in the middle of the glissando [beat 9]. How am I going to do this?” (PS 1).

Body Movement. In a piece for prepared piano, body movement is quite complex, requiring a set of gestures between the keyboard and the soundboard which go beyond the mere execution of the musical notes.

I started working on body movement from the first reading of the piece. I focused first on the soundboard and keyboard individually, and later on transitory movements between them. In Session 13 I decided to sit on the piano bench when playing on the keyboard and stand over the soundboard when playing on the strings. After testing different options, I established these positions as the most comfortable.

After completing the reading stage, I immediately commented on the importance of not forgetting when to sit or stand: "So, in the beginning I forgot that I need to stand. I just sit on bar 3, the 'shimmering'. Until then I will be standing. This is important for the performance. I can't forget" (PS 21).

In the same practice session, the importance of approaching the piece choreographically in the first bars was highlighted: "This needs to be like a dance. So, hand is here, and now here and now here…I am memorising this like choreography now, like a dance" (PS 21). Bars 1 and 2 of the piece are based on different extended techniques requiring different types of gestures. For example, when performing the glissandos on the strings in bar 1, the right hand needs to move through the indicated strings from left to right. The amplitude and speed of this gesture depends on the dynamic assigned to the glissando. Glissandos with the dynamic *piano* require a gesture with small amplitude and slow speed, while glissandos with the dynamic *fortissimo* require very large amplitude and fast speed. The performance and coordination of these gestures was a focus of practice from the first reading to the last performance.

Music sections performed on the keyboard also received comments about body movement, particularly when the piece was being memorised. In Session 29 I noticed: "When the passage is too fast, I can't think about each note. I will just think about the movement" (PS 29).

As time progressed, movements such as sitting or standing developed into expressive devices. As argued by scholars in the areas of embodied expression in music, there is an important connection in music performance between expressive goals, the musical actions executed to pursue such goals, and the resulting sonic and musical product (Caruso et al., 2016; Davidson & Correia, 2002). In Session 43 I emphasised the importance of connecting movement with music meaning: "Ok, I

want to sit dramatically in this chord [bar 97, beat 380]. I think it's more dramatic and I think this will be more effective if I match the movement with the meaning of the music" (PS 43).

When the first performance was approaching, comments on body movement focused on coordination between gestures performed inside the piano and on the keyboard: "In the last sections I need to have a better flow between the strings and the keyboard. It's not natural and it needs to look like a dance, a fluid movement. Let's practice that" (PS 48).

The large focus on unconventional body movements such as sitting or standing over the keyboard provides an example of how performers cope with music following unconventional practice and performance techniques. The performer not only adapts the body to perform the eccentric techniques, but also uses them to express the music to the audience.

Interpretative Topics. When performers embark on the discovery of a new piece of music, they engage in creative interpretation of the possibilities given by the music score (Caruso et al., 2016; Leman, 2016). In this particular piece, former aural or performative models did not support the interpretative process because the music was newly commissioned. During the reading and memorisation stage there was no contact with the composer, thus leaving the interpretation of the music to an interaction between performer, score and instrument.

The majority of interpretative topics during the first learning period were about pedal, sound quality and voicing. In the first sessions I experimented with different pedals to achieve the best sound. In Session 4 I tried using the middle pedal to help distinguish different voices in the polyphonic writing:

> I don't know if it's possible but I am thinking about just using the middle pedal, but I don't know how it will work, but right now I will just use the middle pedal, just to always listen to each single voice (PS 4).

Sometimes I questioned what the composer wrote on the score: The composer asks to play pedal down until the end of this passage. Well, I need to see how it goes. It's a full pedal throughout three pages. I might have to take out the pedal at some points" (PS 7). Throughout the learning progress, pedaling decisions were in constant revision, always with the intent of achieving the most effective sound effects. The

conflict between the composer's ideas and my own received some comments, especially in the early learning periods.

Another important decision in the first stage of learning was to decide how to interpret the complex polyphonic writing. In Session 2, while reading the first polyphonic section of the piece, I decided to imagine my right hand as two feminine voices: "I will see this as a soprano voice and an alto voice, with different timbres" *(*PS 2). The search for different timbres and sound qualities was also a frequent topic of comment in the first and last learning periods.

Throughout the learning process, I also commented on interpretations about dynamic intensity and the development from one dynamic level to the next. As practice progressed, I felt freer to focus on this specific issue.

Finally, phrasing was in my thoughts throughout the entire learning of the piece, but since it is difficult to express in words it received a small number of comments throughout the learning process. Comments on phrasing appeared mainly when I felt overwhelmed with the difficulty of the piece and was neglecting musical direction. For example, in Session 27 I recognised that: "I was so worried about the harmonics that I didn't realise that there is a phrase between these chords and the harmonics. There is a line here" (PS 27).

Expressive Topics. Thoughts on how to express the musical story to the audience only appeared after the piece had been memorised and the artistic form finally understood. The first expressive comments arose in the final sessions of the *Interpretative/Big Picture* stage, when practising the climax of the piece: "This climax needs to be even more dramatic" (PS 40). Four sessions later, the idea of improving communication of the musical story for the audience persisted: "I need to communicate better this idea that the piece will build tension and then will relax until the section before the chain. And finally, surprise with the chain until the end" (PS 44).

One of the main aims of the practice session before the first performance was to work on expressive effects: "My main aim is to exaggerate more the dynamics and the expressive effects. Now that I really know the notes well, I can free myself to do this" (PS 48). This comment explains why no expressive comments were made until the piece was memorised. Only after learning the notes and overcoming technical

difficulties did I free myself to actually think about how to express the story to the audience.

Finally, as pointed out previously, body movement was used in the last stages of practice as an expressive device (Davidson & Correia, 2002). In Session 51, for example, I talked about the importance of standing still above the soundboard to create the feeling of suspense: "In the beginning, when I stand [bar 1, beat 2], I need to stay still to create suspense" (PS 51). After playing the subsequent passage I commented again: "Don't forget to sit dramatically!" (PS 51).

Structural Topics. After years of learning and performing music that follows conventional forms, some musicians can easily understand the structure of some pieces just through quick sight-reading (Chaffin et al., 2010; Ginsborg, 2002). However, *If You Were Here* does not follow a standard structural form.

My concern about understanding how the piece was organised was present from the very first practice session. The first structural decision was made after playing through the first two systems of the piece: "Ok, so then I will start playing on the keyboard, so I will consider this one section…it's based on glissando and harmonics" (PS 1). This initial division was mainly topographic, separating sections based on the piano parts (soundboard and keyboard). Other subdivisions of the piece also considered cues present in the score. In Session 14, I discussed whether or not I should considered a new section beginning after a double bar in the score: "In my opinion, I know this bar follows a double bar, but I don't think this is the beginning of a new section. This bar only has a glissando and I think this glissando works as a bridge between both sections. The new section starts here [bar 27]" (PS 14).

Another criterion used in the first stages to subdivide the piece was tempo changes. For example, in Session 12 I used the composer's indication "Lazy Calm" to label a section starting on bar 67. Curiously, as time progressed, I stopped commenting on that specific section and started mentioning a new and larger subsection named "right hand". Session 30 started, for example, with the following comment: "Today I will work on the right hand section, namely p. 6, 7 and 8. It's the one with the confusing groups of similar notes in the right hand". This gradual change in my understanding of the structure demonstrates how the artistic image of the piece was developed as practice progressed.

During deliberate memorisation I expressed my concern in choosing memorable names for the subsections: “This is the final subsection with the metal chain. Actually, I am just thinking that chain section is a good name for me to remember…the section where I put the metal chain in the piano” (PS 35). I was aware that throwing a metal chain inside the soundboard would be a very memorable moment for me and for the audience, and this is why I used the label “chain” to help me remember this specific subsection.

The highest percentage of comments on musical structure can be found in the third learning period, when a clear idea of the big picture had finally been formed. At this stage all labels had been assigned to the different sections and subsections. The majority of sessions in this period started with a comment on which section I would focus on. For example, in Session 39 I decided to “focus mainly on the ‘right hand’ section”. In the next sessions I moved on to “practise the ‘tremolo’ section” (PS 40) and to work on “the section with the chords” (PS 41). This type of sectional work lasted until Session 44 when I finally decided: “Today I want to practise my ability to convey the overall structure of the piece” (PS 44).

One frequent source of frustration, particularly during the first learning period, was the discovery of switches in different subsections. This was the case for subsections “counterpoint 1” and “counterpoint 2”. In Session 2, I commented on the relation between those subsections with a frustrated voice: “So here Wynton does something similar, but he changes the rhythm” (PS 2). The following day, I kept trying to find the main differences between the subsections: “I can see that this is similar, at least the beginning, but now I don’t have the middle voice like in bar 6. It’s just the upper voice and it’s half the tempo” (PS 3).

When memorisation became the focus of practice, the first strategy was to assign cues to distinguish the switches in both subsections: “Ok, so now let’s memorise the switches. So, first time here… and here second time. In the first time, ah! I have this chord with fingering 5, 3, 2 and the second time I have a tremolo in the left hand” (PS 21). The awareness of how dangerous these switches could be to my memorised performance was present until the very last sessions: “Very important…I can’t mix the first counterpoint with the second. I am confusing them. This is dangerous!” (PS 59).

Summary and Discussion – Self-reports

The analysis of concurrent comments and annotations during practice offers the opportunity to examine decision-making and problem-solving strategies as practice progressed. These results reveal a vast array of problem-solving and monitoring strategies, as well as a change of focus across different musical dimensions as learning progressed.

The focus on basic dimensions was consistent through all learning periods, receiving high numbers of annotations and comments throughout the process.

In previous studies examining learning and memorisation, focus on basic issues tended to decrease as practice progressed (Chaffin & Imreh, 2001; Chen, 2015; Soares, 2015), with the exception of cellist Tania Lisboa, who also focused on basic issues in the last stages of learning (Chaffin et al., 2010). In this study, basic issues associated with critical details of technique followed the same trend. Nevertheless, specific notes, rhythms, fingerings or patterns carefully selected as memory cues were frequently the focus of attention until the last performance. The analysis of comments demonstrates how I was deliberately developing and practising different types of basic PCs to keep track of memorised performance. This can explain why basic dimensions consistently received elevated percentages of comments and annotations until the last performance.

Other basic features comprising less familiar motor actions and body positions (e.g., extended techniques) also required practice until the last performance. However, they followed a different trend of focus, as attention on these techniques largely decreased during deliberate memorisation. One practical explanation for this decrease is the frequent inaccessibility to grand pianos at this stage, which were the only instrument where these techniques could be performed. Another explanation relates to the easiness of committing these features to memory. The performance of glissandos, tremolos or harmonics on the strings is quite distinct from traditional performance on the keyboard. As mentioned above, I was surprised by how easily they were memorised. The fast memorisation of these features is in line with memory theories related to items' distinctiveness (Brown et al., 2007). Some researchers have found that events differing considerably from other items in memory tend to be more memorable (Schmidt, 1991).

In this study, interpretative decisions were made from the start, decreased while the focus was on memorising and consolidating memory, and rose again close to performance. Imreh reported a similar result when memorising Bach's *Italian Concerto* (Chaffin et al., 2002). Soares's (2015) interpretative dimensions were mainly focused on his second learning period, but the author doesn't provide an explanation for these results. Possibly this outcome is related to personal learning styles or to the features of the music.

Expressive dimensions were not a focus of attention during the first stage of learning, but grew in importance close to performance. The focus on expressiveness emerged later on because the big picture was not effectively grasped at the start and I was too focused on dealing with basic issues. The increase of expressive ideas near the performance is in line with previous studies (Chen, 2015; Soares, 2015).

Comments suggest that practice was structured around the score layout (e.g., work on systems and pages of the score) and on my personal understanding of structure. I followed a bottom-up approach to grasp structure and intuitively divided the piece into sections and subsections based on my awareness of changes in musical elements, textures and feelings of tension and relaxation.

Moreover, a deliberate development and use of different types of retrieval cues was reported throughout the learning process and after memorised performance. The PCs reported in both performances were very similar to those noted in previous studies, with the exception of two new subcategories related to the type of language and performance practices used in pieces for prepared piano (extended techniques and positioning of the body). Thinking about a glissando, a tremolo or a harmonic as memory cue would be unexpected in a Bach prelude, as these types of techniques are not used in conventional repertoire. The same could be said of thinking about standing or sitting while playing. Such movements are specific to pieces exploring a combination of keyboard and soundboard sounds. Consequently, these results strongly support Chen's (2015) argument that music style can influence the type of PCs used. The use of patterns to trigger memory of specific finger and hand movements was also reported by this pianist when memorising Ravel's *Ondine* (Chen, 2015).

The encoding of this retrieval scheme involved a multi-modal approach, comprising simultaneous use of different types of memory (kinaesthetic, visual, aural, conceptual). Chunking was a crucial strategy during the reading and memorisation

stages, where it was used to avoid cognitive overload by the large amount of unfamiliar and confusing information and to develop cues to aid memorisation later on.

A detailed analysis of practice behaviour can provide further evidence for these conclusions. As pointed out by Chaffin et al. (2002, p. 201), "there is too much going on" during practice and "it is not possible to mention each decision, let alone the reason for it". While practising *If You Were Here*, it became unfeasible to express everything that crossed my mind. If I were to do such thorough reflection, I would not have the time and focus to actually perform such a complex task. Some practice dimensions probably received fewer comments because they could be sorted almost spontaneously, or just because they weren't considered relevant to mention at the time. However, this does not mean that these dimensions were not important in the practice process. Therefore, the next subsection will present results of multiple regression analyses examining the relationship between self-reports and different measures of practice behaviour.

4.3.3 Multiple Regression Analyses

Following an analysis protocol previously employed in longitudinal case studies led by Roger Chaffin (Chaffin & Imreh, 2001, 2002), multiple regression models were fitted to assess the relationship between practice behaviour (starts, stops and repetitions) and 20 selected musical dimensions.

Musicians choose specific locations of the piece to start and stop their playing during practice. These locations may have been chosen deliberately, or because of problems encountered. Moreover, specific features of the music can receive extra attention resulting in a higher number of repetitions. Regression analysis provides evidence of which musical dimensions are reliability related to the facets of practice described above (Chaffin & Imreh, 2001).

In order to examine the relationship between practice behaviour and different musical dimensions as learning progressed, different multiple regression analyses assessed the relationship between specific musical dimensions (predictors)[24] and the

[24] Most predictors presented non-significant correlations ($r<.29$). As in previous longitudinal case studies, some predictors had small to moderate positive correlations. This was the case for

frequency of starts, stops and repeats (outcome variables) for each learning stage. In this type of analysis, the relationship between the outcome and predictor variables is quantified by regression coefficients (slope values). Regression coefficients estimate, in this specific case, how much the number of starts, stops or repeats changed in the presence of a specific predictor variable. If the regression coefficient is positive, the musician started, stopped or repeated more often the locations of the piece associated to the predictor variable. If the coefficient is negative, the musician actually avoided starting, stopping or repeating the locations associated with the predictor more than other locations.

Multiple regression analysis also evaluates whether the predictor variables have a significant effect on the outcome variable, i.e., if the number of starts, stops or repeats associated with the predictor were consistently higher or lower than other locations. The predictor variables are semi-partialed when a simultaneous regression is used, meaning the predictors are all controlling for each other, i.e., what is the effect of structure on starts controlling for Expressive PCs and the effect of Expressive PCs on starts controlling structure, all at the same time in the same mode. The significance of the individual predictors is conceptually similar to a one-sample t-test which tests the estimated slope of the controlled predictor against a null value of a slope of 0 (Field, 2018). A significant effect provides evidence toward a specific hypothesis, that X predicts Y, whereas non-significant results cannot provide evidence of the against hypothesis. Instead all the researcher can conclude is that in this case we cannot show evidence towards the hypothesis, in other words, we cannot prove the null (slope estimate = 0). Significant of the regression slope estimates are determined by computing the probability (p) of rejecting the null hypothesis. If the p values are below $\alpha = .05$, the probability of confirming the null hypothesis is very low. Low probability values denote in this case that the frequency of starts, stops, or repeats and the musical dimensions selected as predictors are significantly related. The lower the p-value the most significant is the effect of the predictor on the dependent variable.

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interpretative PCs with pedal (r=.0.36) and dynamics (r=.41), structural boundaries with change of character (r =. 38) and expressive PCs (r = .36). Structural PCs presented the higher levels of positive correlation with structural boundaries (r = .64) and switches (r = .57). For this reason, structural PCs were excluded from the model and only structural boundaries and switches were considered.

Table 7 lists the regression coefficients estimating the relationship between the number of starts and the 20 musical dimensions. Each column indicates the regression coefficients computed for each learning period calculated in separate regressions. The last row of the table contains the values of the coefficient of determination (R^2), a metric of the proportion of the variance of the dependant variable explained by the predictors. This coefficient shows how well the regression models fit the data, by indicating the percentage of variance in the dependent variable accounted by the predictors. An significance test (F) accompanies the R^2 value to test if the overall model explains a significant amount of variance given the number of predictors being tested. For example, in learning period 1, the predictors significantly accounted for 42% of the variance of the number of starts in practice.

The regression models with starts, stops and repeats as outcome variables are presented in Tables 7, 8 and 9, respectively. An examination of the R^2 values reveals that the selected musical dimensions were consistently related to practice behaviour (Chaffin et al., 2010, p. 13), accounting for between 11% and 42% of the significant variance (significant models: mean Starts R^2 =.31, mean Stops R^2= .14, mean Repeats R^2= .22). The regression model with repetitions as dependent variable in practice stage 4 was the only model that was not statistically significant.

Table 7. Regression Coefficients (Unadjusted) for the Effects of Musical Decisions (Basic, Interpretative, Expressive and Structural), Score Layout and PCs on the Frequency of Starts in Each Practice Session Set, with R^2.

Starts

Learning Phase	Reading Exploring	Deliberate Memorisation	Interpretative Big Picture	Preparing Performance	Revisiting the Piece
Session set	1–20	21–35	36–41	42–48	49–60
Basic decisions					
Fingering	10.72***	2.92	-2.43	0.29	0.64
Patterns	8.22**	16.02***	7.75***	0.28	4.31***
E. Techniques	-1.76	0.22	-1.50	-0.10	-1.25
Rhythm	-4.12	3.01	-3.04	1.13*	0.13
Positioning	-3.53	-3.61	-3.84	0.18	0.84
Notes	-3.69	-8.16	-6.18	-1.39*	-5.70*
Interpretative decisions					
Pedal	-6.85	2.39	-0.25	1.90***	1.39
Dynamics	5.53*	7.96***	5.59**	0.94**	5.41***

Sound quality	4.96	-0.12	0.27	1.26**	0.74
Expressive decisions					
Change of character	-7.88	-9.10*	-0.00	-0.53	-5.17*
Music structure					
Structural boundaries – starts	16.26***	16.60***	-0.48	2.74***	11.12***
Structural boundaries – ends	0.76	0.55	1.49	0.83	1.76
Switches	57.48***	-5.16	-0.99	-1.56	-5.50
Score layout					
System – starts	7.17**	3.85*	4.51*	-0.50	4.05***
System – ends	-1.63	-1.82	-0.72	-0.11	
Page – starts	32.67***	11.06***	7.86*	0.32	4.66*
Page – ends	-0.90	-0.94	-0.24	-0.29	
Performance cues					
Basic	9.56***	7.09***	5.77**	1.59***	4.56***
Interpretative	11.88***	0.49	-3.63	-0.64	-2.42
Expressive	19.24***	1.19	-2.52	0.98	-0.71
R^2	**0.42*** **	**0.37*** **	**0.14*** **	**0.30*** **	**0.31*** **
***** p <.001, ** p <.01, * p <.05**					

Table 8. Regression Coefficients (Unadjusted) for the Effects of Musical Decisions (Basic, Interpretative, Expressive and Structural), Score Layout and PCs on the Frequency of Stops in Each Practice Session Set, with R^2.

Stops

Learning Phase	Reading/Exploring	Deliberate Memorisation	Interpretative Big Picture	Preparing Performance	Revisiting the Piece
Session set	1–20	21–35	36–41	42–48	49–60
Basic decisions					
Fingering	-2.21	2.27	2.60	-0.54	-0.21
Patterns	-0.80	6.25***	10.28***	0.09	1.06
E. Techniques	-1.93	1.38	0.81	0.22	0.11
Rhythm	16.09***	10.87***	1.93	1.13*	1.85
Positioning	-4.06	1.61	2.31	-0.43	-0.86
Notes	3.38	1.34	2.69	-0.09	-0.71

Interpretative decisions					
Pedal	8.18*	-1.55	-3.66	-0.25	-3.32*
Dynamics	0.31	-1.02	-0.47	-0.22	1.65
Sound quality	0.69	-2.23	-1.24	1.14*	-0.98
Expressive decisions					
Change of character	-2.23	-2.17	-0.37	-0.63	1.70
Music structure					
Structural boundaries – starts	0.34	0.71	1.10	1.30*	1.84
Structural boundaries – ends	21.51***	7.01**	1.15	2.80***	7.45***
Switches	-1.52	-0.18	-0.43	-3.21	-1.30
Score layout					
Systems – starts	0.06	-0.43	-1.74	-0.35	-0.93
Systems – ends	4.42*	0.63	-1.44	-0.37	-0.46
Pages – starts	6.20	7.44	-3.31	-0.33	-0.14
Pages – ends	7.03	10.18***	6.13**	2.94***	4.31**
Performance cues					
Basic	2.82	-1.88	-3.93**	0.43	0.04
Interpretative	-1.61	1.53	3.34	-0.13	3.12**
Expressive	-1.03	0.12	-0.84	-0.48	-3.17
R^2	**0.17*** **	**0.15*** **	**0.11*** **	**0.15*** **	**0.12*** **
***** p <.001, ** p <.01, * p <.05**					

Table 9. Regression Coefficients (Unadjusted) for the Effects of Musical Decisions (Basic, Interpretative, Expressive and Structural), Score Layout and PCs on the Frequency of Repeats in Each Practice Session Set, with R^2.

Repeats

Learning Phase	Reading Exploring	Deliberate Memorisation	Interpretative Big Picture	Preparing Performance	Revisiting the Piece
Session set	1–20	21–35	36–41	42–48	49–60
Basic decisions					
Fingering	59.14***	27.88***	2.74	-5.93	14.44***
Patterns	45.13***	52.22***	54.70***	2.23	37.58***
E. Techniques	-25,40	1.84	8.77	2.11	3.05
Rhythm	4.24	24.50*	1.56	1.04	10.66*
Positioning	-22.75	-4.58	1.15	-1.01	0.34

Notes	59.583*	16.23	2.98	-3.01	5.41
Interpretative decisions					
Pedal	45.95*	-9.40	-10.66	-5.60	-16.80**
Dynamics	-13.72	-5.07	-5.03	-0.75	3.98
Sound quality	-14.68	-20.01	-2.53	-1.61	-11.24
Expressive decisions					
Change of character	-8.67	-5.92	24.62*	-0.16	4.78
Music structure					
Structural boundaries – starts	-22.16	1.74	7.14	-1.46	3.53
Structural boundaries – ends	-12.70	-6.85	-4.37	-1.10	3.70
Switches	80.69*	-15.37	-11.91	-9.99	-17.01
Score layout					
Systems – starts	19.79	14.84*	-2.76	2.87	2.08
Systems – ends	33.55**	20.97	1.79	2.14	4.74
Pages – starts	42.28*	20.78	1.51	1.06	9.65
Pages – ends	44.52*	28.88	19.12*	2.02	16.92**
Performance cues					
Basic	10.30	-1.68	-5.70	1.79	
Interpretative	9.96	0.78	-5.33	0.66	
Expressive	-40.21	-6.49	10.90	-7.73	
R^2	**0.17*** **	**0.20*** **	**0.24*** **	**0.04**	**0.27*** **

***** p <.001, ** p <.01, * p <.05**

As illustrated in Tables 7, 8, and 9 several musical dimensions significantly predicted the frequency of starts, stops and repeats. The elevated number of effects for different types of variables illustrates the complexity of musical decisions and behaviour in music practice. A compilation of the different effects is provided in Table 10. This table summarises the significant effects of the different types of musical dimensions (musical decisions, score layout and performance cues) on the frequency of starts (B), stops (E) and repetitions (R). These are illustrated as a function of learning period and session set (each column representing the effects for different learning periods).

Table 10. Summary of Significant Effects (p<.01*) of Musical Decisions (Basic, Interpretative, Expressive and Structural), Score Layout and PCs on the Frequency of Starts (B), Stops (E) and Repetitions (R) as a Function of Learning Period and Session Set, with Effects on Starts Highlighted and Effects on All Three Measures at the Same Time in Bold Italic.

Summary Table					
Learning phase	Reading Exploring	Deliberate Memorisation	Interpretative Big Picture	Preparing Performance	Revisiting the Piece
Session set	1–20	21–35	36–41	42–48	49–60
Basic decisions					
Fingering	BR	R			R
Patterns	BR	***BER***	***BER***		BR
E. Techniques					
Rhythm	E	Er		be	r
Positioning					
Notes	r			-b	-b
Interpretative decisions					
Pedal	er			B	ER
Dynamics	b	B	B	B	B
Sound quality				Be	
Expressive decisions					
Change of character		-b	r		-b
Music structure					
Structural boundaries – starts	B	B		Be	B
Structural boundaries – ends	E	E		E	E
Switches	Br				
Score layout					
Systems – starts	B	br	b		B
Systems – ends	eR				
Pages – starts	Br	B	b		b
Pages – ends	r	E	Er	E	ER
Performance cues					
Basic	B	B	BE	B	B
Interpretative	B				E
Expressive	-b				

**Effects on starts, stops and repeats that were significant at the p < .01 are shown in capital letters while effects at the p <.05 levels are represented by lower cases b, e and r.*

Table 10 reveals that decisions made during practice, PCs and other dimensions, such as score layout, influenced how the piece was studied. Several dimensions selected as predictors were able to predict the most frequent starting and stopping points and the locations of the piece that received extra practice (Chaffin & Imreh, 2001). Out of the 300 potential effects of the predictor variables, 37 were significant at the $p<.001$ level, 14 at the $p<.01$ level and 23 at the $p<.05$ level. The majority of the effects are positive, demonstrating that starts, stops and repeats occurred more often in locations with the dimensions listed. However, some effects were negative. As pointed out by Chaffin and Imreh (2001, p. 57), "explanations of negative effects are more speculative than explanations of positive effects because they are less expected". Negative effects may suggest that the musician was deliberately avoiding or delaying work on those dimensions until later in the process (Chaffin & Imreh, 2001) or, as suggested by Chaffin et al. (2010, p. 13), "practicing in context", by "playing through features or cues without stopping".

Basic Decisions and PCs. The focus on basic decisions and basic PCs was consistent throughout the learning stages. These multiple regression analyses corroborate the self-reports provided in the annotated scores and concurrent comments.

Fingering decisions affected practice when reading, memorising and revisiting the piece after the first performance. In the first learning period, beats in the score with fingering decisions served as starting places and received intensive practice. As pointed out above, comments on fingering decisions at this stage were also frequent. Beats containing fingering decisions were also practised more repeatedly than those in other locations, thus confirming the focus on this dimension in the first learning stage. The intensive practice of fingering also continued during the deliberate memorisation stage. As mentioned before, this dimension was also used as a type of cue to help remember changes of hand position, thus explaining the extra practice of this feature at this stage.

This dimension ceased to impact practice in the learning periods close to the first performance. As discussed below, practice immediately before the first performance was mostly affected by overall dimensions such as critical points in the formal structure, interpretative ideas and PCs, suggesting that a global framework of the piece was being prepared for performance. Nevertheless, the analysis of comments at this stage provides contradictory results. The frequency of comments on

fingering actually increased. As mentioned before, I revised a specific fingering and commented more frequently on my reasons to make such a decision. However, this does not mean that this specific decision required extensive practice. The focus on this fingering was not consistent enough to demonstrate statistical significance in relation to other dimensions.

Fingering effects return after the first performance, when revisiting the piece. Once again, I decided to change some fingerings to create a more powerful sound effect. At this stage, effects of fingering on repetitions were significant, demonstrating that, in this case, the revised fingering decisions required extra work before the second performance.

The basic decision with the most robust effect was patterns. As mentioned before, patterns were chunks of notes used to avoid cognitive overload in the very challenging switch sequences. In the first learning period, patterns served more often as starting points and were also practised more exhaustively. This result suggests that the chunks used to encode and retrieve the piece developed from the moment I began reading the piece. The effects became even more robust during the deliberate memorisation and interpretative/big picture stages while memory was being established and consolidated. During both periods, patterns served both as starting and stopping places and were repeated extensively. The presence of effects for all three measures indicates "intense practice of short segments" (Chaffin et al., 2010, p. 13). This result supports the idea that the divide-and-conquer strategy was used to encode and consolidate the chunks, by singling them out for individual practice.

The only period when patterns did not have a significant effect was right before the first performance. As mentioned previously, practice at this stage appeared to be segmented at more general levels of the hierarchical structure, integrating the lower levels of structure into larger sequences. Therefore, patterns appeared to be integrated within wider phrases, subsections or even sections. Attention to individual patterns returned in the last stage of practice. During this period, these chunks were practised more intensively and used more often as starting points. As noted in the analysis of the comments, the patterns needed some revision at this stage, because I noticed some decline of their recall after the month-long break following the first performance. These results strongly support the idea that chunking (a principle advocated in influential theories of expert memory) was used to encode this piece. The chunks developed during practice served frequently as starting and stopping places

throughout most learning stages and were practised more often than other musical dimensions.

Rhythm had a significant effect on stops when reading, memorising and preparing the piece for performance. The elevated number of stops in places where this dimension required attention was probably due to the rhythmic complexity of the piece. This particular challenge apparently required interruption of playing to untangle the rhythmic figures or solve problems related to this issue. Rhythm affected practice once again in the period prior to the first performance. As mentioned before, I developed counting sequences to keep track of the recurrent changing rhythms in the piece. The comments revealed that the coordination between counting and finger movements required work. The significant effects of rhythm on starts and stops at this stage confirms this result. Finally, this dimension received a significantly higher number of repetitions in the last learning stage, suggesting that the rhythmic counting needed extra practice.

While counting sequences were used to keep track of changing rhythms, specific notes were singled out as cues to help distinguish beats that couldn't be grouped into clear chunks. These notes were repeated more often than others in the first learning period. The elevated number of repetitions may be due to the high degree of difficulty in these passages and/or to an attempt to start establishing them as cues to distinguish the different beats. In the last learning periods, the effects of these notes were negative, indicating that they were practised in context by playing through them. Some video recordings of this period demonstrate this type of practice, namely playing through these passages while saying the names of the notes out loud. The aim was not to practise the notes individually, but to make sure I remembered them at the right moment when playing through the passage.

The only basic dimensions that did not significantly affect practice were extended techniques and the positioning/movement of the body (sitting or standing). This result is not surprising, as practice of these dimensions was limited by the availability of a grand piano. Because I couldn't practise regularly on this type of instrument, I was often forced to focus on the keyboard parts of the piece. This practical issue limited the study of these two dimensions. However, it is important to emphasise that the lack of availability of a grand piano was not a cause of concern. On one hand, the extended techniques were very easy to remember. On the other, because the position of the extended techniques differs between piano brands, I

deliberately avoided repeating them extensively. The aim was to keep the memory of these dimensions flexible, to ensure quick and effective adaptation to different grand pianos.

Some of the basic features discussed above turned into PCs. Basic PCs were the only ones affecting practice in all learning periods. They were often used as starting points from the reading stage of the piece until the very last learning period. Starts on this type of PCs in the reading stage indicate that they were singled out and distinctively dealt with from the very first moments of practice. As claimed by Chaffin & Imreh (2001, p. 58), this does not mean they were originally set out as cues to monitor memorised performance. However, their significance was noted in the first learning stage. The foundation that would later support memorised performance was being developed very early on.

In the subsequent learning periods, basic PCs continued to significantly affect starts, demonstrating that I was developing a content-addressable memory of these locations and establishing them as retrieval cues (Chaffin, Logan, et al., 2009; F. Gobet, 2015). In the interpretative big picture, basic PCs were also used as stopping points. This may reflect the individual practice of patterns that were singled out as cues for memorised performance. However, the examination of the effects of different types of basic PCs should be further explored.[25]

Interpretative Decisions PCs. Interpretative decisions also affected practice in all learning periods, but their effect increased in the periods preceding the performances. This result indicates that the focus on these issues increased as practice progressed, even though basic issues continued to affect practice.

Pedaling decisions required playing to stop frequently in the first learning period. At this stage I stopped to make pedaling decisions and to note them on the score. Beats with pedaling decisions were also practised more repeatedly at this stage, indicating that they were a focus of attention while reading through the piece. The effects of pedaling reappeared in the last stages of practice, first affecting starts and later stops and repetitions. As indicated by comments during practice, pedaling decisions were revised as the learning progressed, to work on sound quality and

[25] These effects will be further explored in a future publication based on more advanced linear models developed in collaboration with Roger Chaffin and Alexander Demos.

sound effects. A detailed analysis of the video recordings at these stages reveals that I was not happy with some pedaling effects and was often working to find the desired effects.

Several starting points in all learning periods were related to dynamic decisions. The decisions on dynamics were often connected to dynamic effects which required work throughout all learning process. Places requiring special attention to sound quality were also singled out close to the first performance, producing positive effects for starts and stops in practice.

Some of the interpretative features discussed above were later used as interpretative PCs. These PCs served as starting points during the reading period, suggesting they were focus of work from the very early stages of practice. However, they often served as stopping points in the revision stage. Although further analyses of different types of PCs is needed to reach further conclusions, my deduction as pianist is that this result is probably associated with pedaling PCs, because I was not pleased with the pedal effects and interrupted playing very often at these locations to work on this issue.

Expressive Decisions and PCs. Expressive decisions and expressive PCs produced negative effects on starts during the second and final learning periods, indicating that I was playing through these locations. Places where the character changed in the piece were also repeated more often during the interpretative/big picture stage. One possible explanation is that after memorising the piece, I finally laid the groundwork to focus more on these expressive issues. The analysis of annotations in the score and concurrent comments supports this claim, as expressive dimensions only appear in the last stages of practice. However, the expressive features that turned into PCs actually produced negative effects for starts in the first learning period, suggesting that, even if intuitively, I noticed the importance of expressive features that would help monitor the performance very early in the learning process.

Music Structure/Structural PCs. As has been noted in previous longitudinal case studies, critical places in the formal structure were consistently used as starting and stopping places in most learning periods. Interestingly, this was not the case when the artistic image of the piece was clearly formed. Such a result is not surprising, because an overall big picture of the piece is usually acquired by it playing through and

integrating smaller segments, not by isolating the different sections and subsections (Chaffin et al., 2003).

Even though I reported acquiring an overall understanding of structure in the third learning period, its influence is clear from the very first stages of practice, as critical structural points were often used as starting and stopping places.

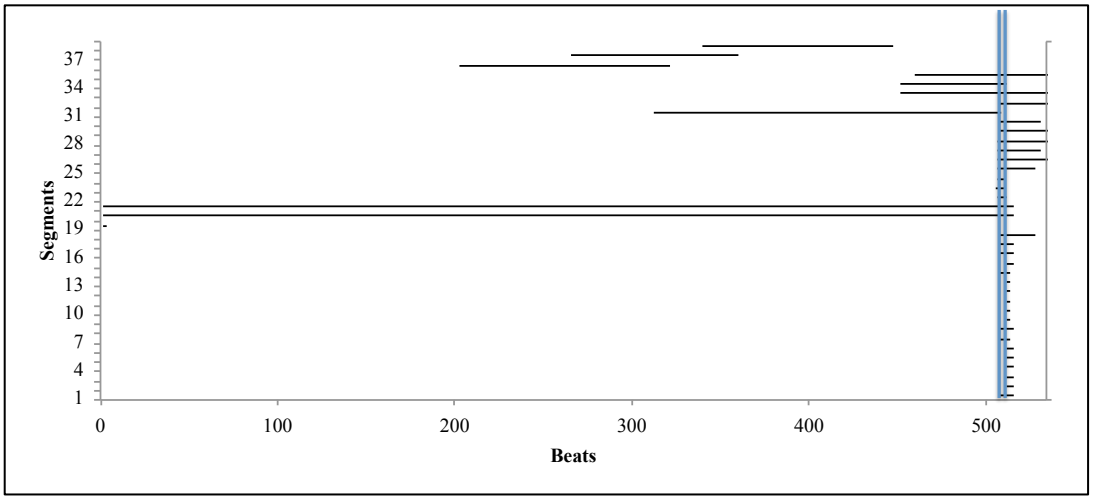
The significant effects of structure on practice behaviour across all learning periods strongly suggest that my understanding of structure formed the higher levels of a retrieval structure used to encode the piece. The majority of sections and subsections were also reported as PCs in both performances, thus suggesting that this higher level of retrieval structure also had a crucial role when retrieving the piece.[26]

Score Layout. The segmentation of the piece for practice was also based on the score layout. Beginnings of systems and pages of the score were used as starting and stopping places through all periods and were also repeated more often than other locations. This dimension produced a large number of effects in the first learning period. Practice often started at the beginnings of systems and pages and tended to stop at the ends of systems. The beginnings and ends of pages and systems were also repeated more often than other locations. The presence of effects on starts and stops, both on critical points of musical structure and score layout indicate that these two dimensions were used simultaneously to organise practice at this stage. During deliberate memorisation, the pages of the score were also singled out for practice, while combined with beginnings and ends of musical structure. Curiously, musical structure stopped affecting practice in the third learning period, while page layout continued producing effects for all practice measures. This result is easily explained by the practice graphs, which demonstrate that practice alternated between run-throughs and work on specific systems or pages containing features (e.g., patterns) requiring memory consolidation. Figure 19 presents an example of a practice graph from the first stage, illustrating how the work focused largely on the last systems of the piece, places where patterns required further practice. The work did not start in the corresponding structural boundary because the beginning of that subsection required performance using extended techniques (throwing a metal chain) and was

[26] The reported structural PCs were not separated from musical structure in this model because the significant agreement between both dimensions could affect the results of the regression model.

not considered necessary when working on the chunks. The graph also illustrates that work on patterns was completed with run-throughs of the piece.

Figure 19. Practice Graph from Session 16 Illustrating Work Focused on Small Segments Located Within Specific Systems of the Score (Represented by Blue Lines), interspersed with a Small Number of Larger Segments.



When preparing for the performance, there was a clear change of focus of practice from score layout to music structure, as only page ends were used more often as stopping places. The simultaneous use of music structure and score layout returns when revisiting the piece, because integration of sections and subsections was interspersed with work on smaller segments located in specific systems of the score.

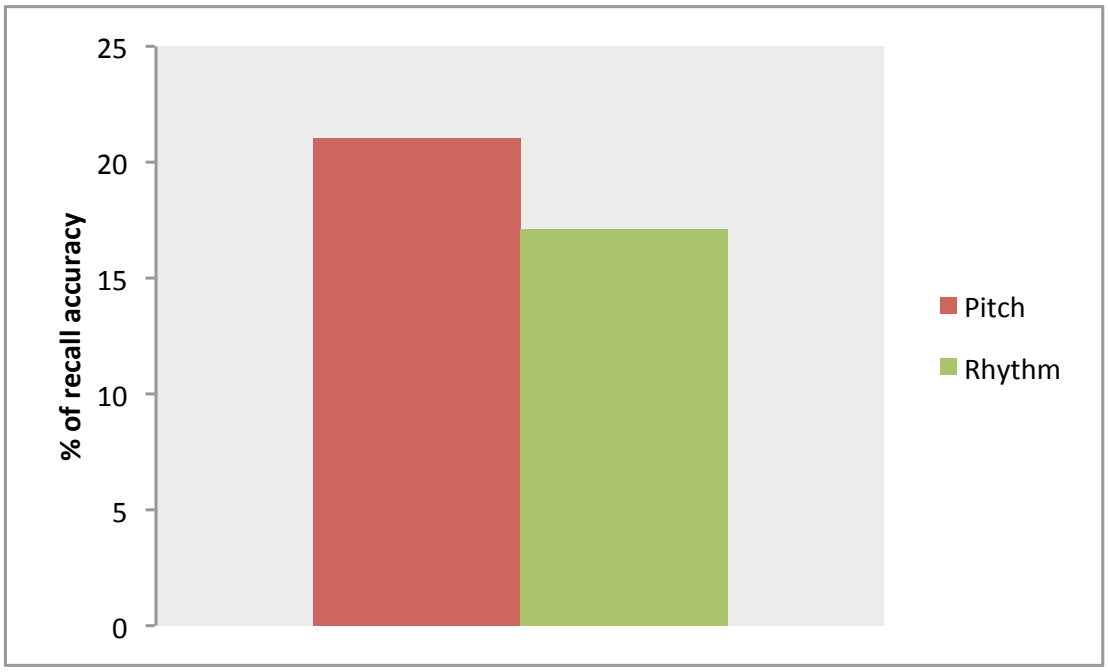
To my knowledge, no previous longitudinal case study contributing to PC theory has considered this dimension as a possible predictor. However, the high frequency of comments on practice segmentation based on score layout suggested that, in this specific case, this dimension can also predict an elevated number of starts, stops or even repetitions. As previously demonstrated this hypothesis was confirmed in this study.

4.3.4 Free Recall After Nine Months

Given the high level of complexity in this piece, it is not surprising to find that after nine months away from it, the music had been considerably forgotten. The difficulty of writing such a complex piece with unconventional techniques (writing of

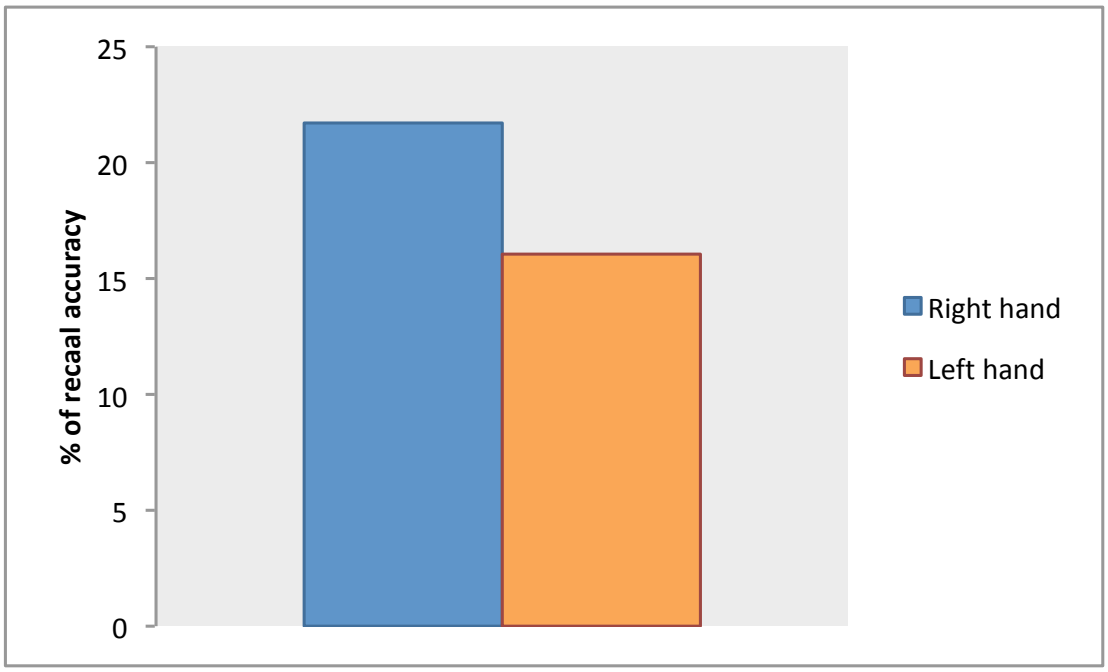
glissandos and harmonics on the strings) can also explain the large decline in recall. Only 22.22% of the piece was recalled accurately, 30% less than the cellist Tania Lisboa when performing a long-term written recall test of the Prelude from Bach's Cello Suite No. 6 (Chaffin et al., 2010, p. 15). Recall of pitch was slightly more accurate than rhythm. However, the difference of percentage was only 4% (see Figure 20).

Figure 20. Percentage of Recall Accuracy for Pitch and Rhythm.



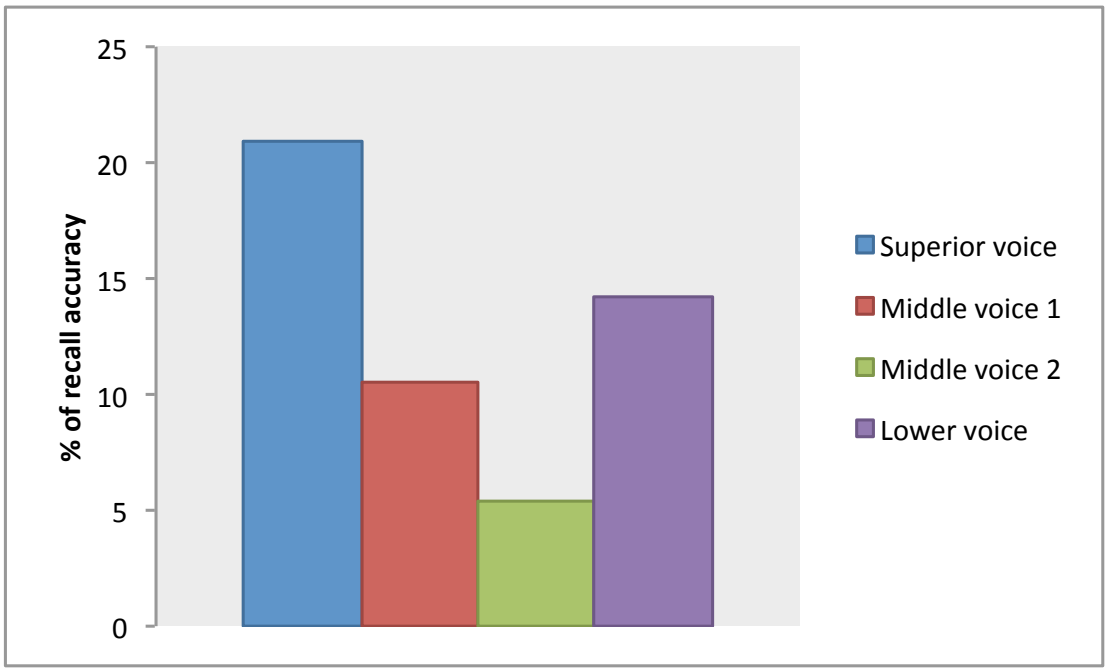
The beats of the piece performed with the right hand were more accurately recalled than the ones performed with the left hand, with a difference of 5.67% (Figure 21). A similar result was also found in a written test performed by pianist Imreh when recalling Bach's *Presto* from the Italian Concerto (Chaffin & Imreh, 2002).

Figure 21. Percentage of Recall Accuracy for Right and Left Hands.



As illustrated in Figure 22, further inspection of recall for the different polyphonic voices of the piece indicates that recall was less accurate for the middle voices and more accurate for the superior voice (20.88%). A possible explanation for this result is the salience of higher and lower pitches. This new effect, which was never addressed in previous longitudinal case studies will be further examined in future publications.

Figure 22. Percentage of Recall Accuracy for Different Voices in the Polyphonic Writing.



Multiple regression analysis examined the relationship between the probability of correct recall and the dimensions reported as important during memorised performance (music structure and PCs). The regression model assessed the effects of serial position from structural boundaries and different types of PCs on probability of recall. In order to assess whether the distinctiveness of the extended techniques also affected long-term recall, they were also included as predictors in the regression model.

Table 11 provides a summary of the regression analysis, demonstrating that these dimensions reliably affected long-term recall, predicting 20% of its variance (R^2=.20).

Table 11. Regression Coefficients (Unadjusted) for the Effects of Serial Position of Beats from PCs and Beginnings of Structural Boundaries, Systems and Pages on Probability of Correct Recall, with R^2 and First-order Autocorrelations.

Effect of serial position from	Regression coefficients
Starts of structural boundaries	-.049**
Basic PCs	-.031**
Interpretative PCs	.005
Expressive PCs	-.048**
Extended techniques	-.019*
R^2	.20**
1st order autocorrelation	.34**

***p<.001, *p<.05*

Negative coefficients indicate that probability of recall declined as distance from the predictor increased, thus denoting a typical primacy effect (Chaffin et al., 2010, p. 16). Negative serial position effects were found for beginnings of structural boundaries and for all types of PCs, except interpretative. These results indicate that memory was better at basic, structural and expressive cues, and weakened in the subsequent beats. PCs and musical structure became landmarks in LTM of this piece, providing content-addressable memory of these locations. As explained by Ginsborg and Chaffin (2011a, p. 354), these structural boundaries or PCs cue the retrieval of the subsequent beats until at a certain moment the link fails and the chain is broken. This is why recall is better on the cue and declines as distance from the landmark increases.

The negative serial effects of structure and expressive PCs were also found in previous studies examining the serial position effects of PCs in written long-term recall (Chaffin et al., 2002, pp. 212– 216; Chaffin et al., 2010, pp. 16-17; Ginsborg & Chaffin, 2011a). However, in previous studies, basic PCs had positive serial position effects, indicating that basic PCs did not provide direct content-addressable memory. In this study the effect was in the opposite direction. It is important to note that basic PCs had significant effects on practice behaviour throughout the learning process. Additionally, basic features continually received high percentages of comments and annotations on the score throughout the learning process. In fact, I was very impressed when, after nine months, I could write out every single note and rhythm of some basic features (e.g., patterns). In the process of memorising this piece, basic PCs were not only related to important details of technique and execution, but also to

the conceptual representation of chunks found in the music to help reduce the cognitive overload of very complex sequences.

Curiously, extended techniques also produced significant effects on long-term recall. The negative coefficient (-.19) indicates once again that memory was better at locations with extended techniques and decreased with distance from this feature. This result is very interesting, because extended techniques did not produce significant effects in practice. Even though they were not practised as much as other dimensions in the piece, they still remained in LTM. These distinctive features were not only easier to memorise, but also remained in memory after nine months without any contact with the piece.

4.4 GENERAL DISCUSSION

This chapter presented the results of a large-scale, longitudinal case study examining 57.66 hours of retrieval practice of a non-tonal piece challenging performative conventions. The study provided strong evidence that principles found in influential theories of expert memory in music apply to the memorisation of a non-tonal piece for prepared piano, with a few variations related to the specific features and challenges of this type of repertoire.

In this study, different sources of data indicated that memorisation involved the development of a hierarchically organised retrieval scheme. As in previous research, the scheme was organised around the musician's understanding of the formal structure of the piece and the development of different types of retrieval cues (Chaffin et al., 2010, 2013; Chaffin & Imreh, 2002; Chueke & Chaffin, 2016; Ginsborg & Chaffin, 2011; Soares, 2015).

Even in the presence of music with unfamiliar structures, the learning process was accompanied by a clear effort to understand the organisational basis of the music and to use the structural framework to guide practice. Nevertheless, the absence of a traditional standard form delayed an overall understanding of structure, which was built as practice progressed.

Previous longitudinal case studies contributing to PC theory advocate that musicians approach learning and memorisation tasks with a big picture of the piece "already in mind" (Chaffin et al., 2003, p. 486). Even when the structural form is not

obvious at first, professional musicians have reported using musical analysis (Chaffin et al., 2013; Chueke & Chaffin, 2016), or listening to recordings (Soares, 2015) before the learning starts. After an initial overview, musicians work on more detailed features and difficulties, and engage in overlearning near the performance (Mishra, 2005). This study followed similar stages of learning, but with a substantial difference. Because of the challenging features of the piece, it was not possible to begin with an artistic image of the music in mind. The less familiar writing of glissandos, harmonics or tremolos on the soundboard hindered a quick grasp of the big picture through sight-reading, or even through a notational overview (musical analysis). Soares's (2015) strategy of listening to existing recordings was also inaccessible, because the piece had yet to be performed for the first time. The artistic form was thus built simultaneously while figuring out technique.

The absence of a standard structure led to a subjective organisation of the music, based on intuitive perception of varied textures, musical elements or specific difficulties (Cooke, 1999; Soares, 2015; Williamon & Valentine, 2002). Even in the absence of a ready-made framework to organise encoding, as in previous longitudinal case studies (Chaffin et al., 2010; Chaffin & Imreh, 2002), the meaningful segmentation of the piece into sections and subsections had a key role in the encoding and retrieval of this music. Critical locations of the subjectively formed formal structure were often used as starting and stopping places in practice throughout all learning stages. Practice was structured around a combination of this personal formal structure and the visual organisation of the score into systems and pages. The PC reports also revealed that critical structural locations were used as landmarks to monitor memorised performance. Evidence that structural locations of the piece became landmarks in LTM was provided by the written recall test performed nine months later, without any contact with the piece. Negative serial position effects demonstrated that memory was superior in these structural locations and declined with distance from the structural landmarks. This result strongly corroborates previous studies examining long-term written recall (Chaffin et al., 2010; Chaffin & Imreh, 2002; Ginsborg & Chaffin, 2011).

The important role of structure in memorisation has been advocated in the literature on musical memory (Aiello & Williamon, 2002; Ginsborg, 2017) and supported by consistent evidence provided by observational studies examining musicians of different levels of expertise memorising different styles of repertoire

(Chaffin et al., 2010, 2013; Chaffin & Imreh, 2002; Ginsborg & Chaffin, 2011; Soares, 2015; Williamon & Egner, 2004; Williamon & Valentine, 2002). As first suggested by Soares (2015) and Chaffin & Chueke (2016), even when the music does not follow standard forms, musicians can still use their previous knowledge and intuitive sense to build a story for the piece.

This study also provided further evidence that experienced musicians develop different types of PCs to monitor memorised performance. The combination of self-reports and practice data strongly indicates that different types of PCs guided practice and performance of the piece. The unconventional features of *If You Were Here* led to the development of new types of PCs, named as extended techniques and positioning/body movement. These cues were directly connected to the unconventional music language and performative practices of the music.

Basic PCs affected practice throughout the learning process. The constant focus on basic issues was also revealed in the analysis of concurrent comments and annotations throughout the learning process. With the exception of Lisboa et al. (2010), previous longitudinal case studies have reported a decrease in the effects of basic PCs, followed by increased effects of interpretative PCs (Chaffin & Imreh, 2002; Soares, 2015). In this study, effects of interpretative PCs also increased in the last stages of learning, but the effects of basic PCs remained. This was also the first longitudinal case study contributing to PC theory to report negative serial position effects for basic PCs. Previous studies examining written recall have consistently identified opposite effects, as memory for these cues has usually been found to be worse than the subsequent locations (Chaffin et al., 2010; Chaffin & Imreh, 2002; Ginsborg & Chaffin, 2011).

The basic PCs developed for this piece can explain this result. In previous studies, this category was mainly related to critical details of technique (e.g., fingering, bowing, intonation) and was connected to relevant motor actions that are absent in a written recall test (Chaffin & Imreh, 2002, p. 348; Chaffin & Lisboa, 2008, p. 131). In this study, several PCs were based on elementary information from the score (notes and rhythm), which were used as labels for chunks that were later used to trigger memory of the switch sequences. Consequently, these PCs were practised extensively to ensure that the relevant motor actions would be properly connected to a conceptual representation of the chunks. The extensive practice of

these cues and the deliberate effort to develop conceptual memory of these features may have contributed to the effects found in practice and in the written recall test.

Expressive PCs only produced significant effects in practice in the first learning period. However, the written recall test suggested that they became some of the main landmarks in LTM of the piece. Previous studies on written recall also identified expressive cues as important landmarks (Chaffin et al., 2010; Chaffin & Imreh, 2002; Ginsborg & Chaffin, 2011). Even if not practised more extensively than other features, expressive features were, in this case, important moments of the story plan that I developed for this piece and ended up remaining in LTM.

The results discussed provide strong evidence that a hierarchical retrieval scheme organised around a subjective understanding of music structure and composed of different types of PCs was used during encoding and retrieval of *If You Were Here*. Multiple sources of data indicate that this retrieval scheme was extensively practised. The analyses of practice behaviour revealed several effects of music structure and PCs on starts, stops and repetitions in practice throughout all learning periods. Moreover, the high frequency of annotations in the score and comments during practice of these features indicates that they were a frequent focus of attention.

The concurrent comments suggest that preparation of this piece for performance involved a multi-modal approach. Depending on the specific feature and difficulty of different parts of the piece, memorisation focused on different sensory elements of performance. Some chordal figurations memorised were based on visual representation of the keyboard or hand shapes. The middle voices of polyphonic sections were sung to help develop aural memory. Kinaesthetic memory, on the other hand, was considered vital in the very fast passages and when the body moved between the different parts of the piano (keyboard and soundboard). In some sessions, particularly in the final learning periods, I was memorising the piece like a choreography, as a set of gestures interconnecting performance between the soundboard and the keyboard. Movement and musical gesture appear to have had an important role in the memorisation of the piece. The effects of this dimension were not reflected in the practice behaviour, probably because the lack of availability of grand pianos decreased the opportunities to practice the movements between the soundboard and the keyboard. The effects of movement will also hardly be shown in

a recall test.[27] Played recall tests can help provide further evidence of the role of movement in the LTM of this piece.

Besides visual, aural and kinaesthetic strategies, conceptual methods of encoding also had an important role in memorisation. One strategy that stands out was the chunking of notes into patterns. The use of chunking appears to be a hallmark of expert memorisation (Gobet, 2015). PC theory also states that the use of chunking appears to be a principle of expert memory in music. However, previous longitudinal case studies have not been able to provide robust evidence for the use of this principle. Imreh reported using knowledge of familiar patterns in Bach's Presto to decide fingerings, but these patterns did not produce significant effects in practice (Chaffin & Imreh, 2002). Chen (2015) also mentioned developing pattern PCs to help trigger memory of specific hand shapes, but her conclusions are based solely on self-reports. Some experimental studies provided evidence for chunking by musicians (Halpern & Bower, 1982), but are solely based on very short combinations of pitches and rhythms.

In this study, the search for patterns in the music was a frequent topic of comment, particularly while deliberately memorising the piece. Later, some of these patterns were reported as PCs in both memorised performances. These chunks produced the most significant effects throughout the learning process, affecting simultaneously starts, stops and repeats. I was surprised when, after nine months without contact with the piece, I could write down the majority of these patterns.

In this piece, the tonal chords, scales or tonal progressions that can be easily recognised in tonal pieces were not available. Nevertheless, previous knowledge of intervallic relationships allowed the recognition of chunks in less familiar musical material. New studies on expert memory of randomised material also suggest that, even when the memorisation task is contrived, expert's knowledge of the domain allows them to find some chunks in the random material. The attempt to connect previous knowledge of the domain with new information has also been reported in previous studies examining the memorisation of non-tonal music (Soares, 2015; Tsintzou & Theodorakis, 2008).

[27] Two played recall tests ando one additional written recall test were performed after the last performance and their analysis will be published in future.

As pointed out at the beginning of the Results section, *If You Were Here* was one of the most challenging pieces that I have had to memorise during my studies and professional career. The memorisation challenges posed by the frequent presence of switches were at first considered almost unmemorisable and not worth the effort. However, the inability to turn pages properly also hindered the performance of the piece, which involved body movements between the keyboard and soundboard. In the end, the development of the story of the piece and the combination of chunking with several strategies based on different memory types enabled a confident memorised performance.

It is important to point out that not all parts of this piece were considered challenges to memorisation. The innovative extended techniques were actually quite memorable. The lack of effects in practice indicates that they did not require much work. However, results from the written recall tests reveal that memory was better for extended techniques and decreased as distance from these features increased. Even though they were not extensively practised, they still remained in LTM. The explanation proposed in this study is based on theories of memory asserting that certain phenomena are better recalled because of their distinctiveness. Research in this area has suggested that distinctive events (i.e., events that largely differ from other items in memory) tend to be more memorable (Schmidt, 1991). Extended techniques can be considered distinctive because they differ to a great degree from common motor actions in piano performance. Such distinctiveness could explain why they became more memorable than other features in the piece and, consequently, why they did not require as much attention during practice and memorisation.

This study has provided a detailed account of how one pianist coped with a challenging non-tonal piece that defies conventional performance practices. The next chapter will extend this study to a shorter piece with an even less discernible structure and will examine how other pianists have faced this challenge.

5 MEMORISING BERIO'S *LEAF*: A MULTIPLE-CASE STUDY

5.1 INTRODUCTION

The previous chapter provided a detailed description of how the author formed, used and manipulated a hierarchically ordered retrieval structure for a long non-tonal piece that used modern performance practices. The features of the retrieval structure were very similar to the ones described by theories of expert memory in music (Chaffin & Imreh, 2002; Williamon & Valentine, 2002).

The present study aims to broaden the exploration of retrieval structures in non-tonal piano repertoire, by examining the memorisation approaches of other pianists for a short serial piece based on dodecaphonic techniques.

Several authors agree that serial music is difficult to comprehend and remember (Imberty, 1993; Kivy, 2001; Meelberg, 2006; Packalén, 2005). Although based on strict rules of composition, which can be detected visually and intellectually, current research on auditory music perception has found that these principles cannot be clearly recognised aurally (Lerdahl, 1992; Meelberg, 2006). Raffman (2003) argues that serial music has the fundamental defect of not communicating pitch-related sense. Meelberg (2006) also claims that, because it does not follow tonal orders and conventions, it doesn't feel "natural" to a listener used to Western tonal music, thus hindering intuitive perception of structure. In this type of music, tonal rules assigning hierarchical roles to musical pitches are replaced with serial principles which consider the twelve pitches as equally important, thus removing the feelings of tension and release easily perceived in tonal music (Packalén, 2005). This gives rise to more arbitrary structural possibilities, as perceivers are less constrained in terms of how they structure the music. The literature on music perception claims that this music is not only more difficult to perceive, but also to remember (Imberty, 1993; Meelberg, 2006). Imberty (1993) argues that the rows used to compose serial pieces cannot serve as reference system in perception and memory. This research is based on short-term aural perception of small atonal excerpts. Will the same principles apply to performers' learning and memorisation of serial music? Performers use means other

than aural to encode the music and engage with the musical material for longer periods of time.

Soares (2015) provided a retrospective report of his experience of learning Boulez' *Douze Notations* (1945) over a seven-year period. The pianist recognised that traditional analysis using compositional rules was not as useful for memorisation as in tonal pieces (Soares, 2015, p. 148). As suggested by Imberty (1993), the composer's organisation of the twelve-tone row was not used as a structural framework to encode the piece. Nevertheless, the pianist relied on intellectual recognition of those rows to confirm some of his own instinctive cues. Soares (2015) still developed a hierarchical conceptual framework to organise his practice, based on his subjective interpretation of the musical structure. The structural boundaries became landmarks in this pianist's long-term recall, as confirmed by several played recalls. Meaningful perception of music structure was also invaluable for pianist Zélia Chueke when developing a retrieval scheme for memorising the opening passage of Arnold Schoenberg's Op. 11 No. 3. Her structural interpretation was once again personal and not based on theoretical analysis of twelve-tone rows (Chueke & Chaffin, 2016).

The existing studies on memorisation of music based on serial techniques suggest that, even though structural meaning is more difficult to grasp, the feeling of hierarchical organisation is still vital for music encoding and retrieval. Nonetheless, they are both single-case studies examining evidence primarily based on self-reports. So far, there is still a gap in research looking at how different pianists encode and retrieve the same piece, as well as exploring in-depth the role of hierarchical retrieval structures in this context.

5.2 THE STUDY

5.2.1 Aims

The purpose of this study was to provide a deep examination of learning and memorisation approaches adopted by postgraduate students as they memorise a short serial piece. The first aim was to examine the development of retrieval structures in

this type of repertoire. This study examined if and how musicians develop retrieval schemes when the encoded information substantially differs from their stored knowledge.

The second aim was to understand how the development of retrieval structures for the same non-tonal piece varies across different musicians. Following a multiple-case study design, the features of retrieval structures developed by different pianists for the same non-tonal piece were explored in great depth.

The final aim was to explore in detail learning and memorisation strategies employed by musicians to encode and retrieve this music. The study examined a range of the memory types and varied memory cues used to commit this piece to memory, as well as segmentation techniques and how they affect learning and memorisation.

5.2.2 The Music

The piece selected for this study is *Encore No. 2 (Leaf)* for piano by Luciano Berio (see Appendix 6). This encore is a very short non-tonal piece (around 1 min long) of 41 bars (82 beats).

Luciano Berio is a renowned Italian modernist composer whose compositional style draws on atonal techniques developed by the Second Viennese School (Kim, 2014). Berio was one of many composers who emphasised the relativeness of musical rules and processes, by actually breaking and transforming those rules (Berio, 1996, p. 169). He argued that past musical models and procedures should be used to develop stimulating new identities in a composer's own music (Kim, 2014).

Leaf belongs to a set of *Six Encores* composed by Berio between 1965 and 1990. This piece is a good illustration of how he explores harmonic vocabulary and rhythmic gesture, and distorts sonorities through pedal techniques (Doll, 2007). The composer does not indicate any key signatures, excluding the existence of a tonality. The use of pitch is inspired by a twelve-tone chromatic scale, which is combined into blocked dissonant chords (Kim, 2014). The twelve-tone row is exposed straight away, in the first three measures of the piece. What follows is a combination of those chromatic tones grouped into clusters with varied rhythmic formations and different

articulations. Some authors, like Fomalgaut (2017, p. 10), associate this random rhythmic motion to a trembling leaf in the wind.

This piece uses a sostenuto pedal effect to create hidden polyphonies of resonances, which distort the listener's perception of harmonic and rhythmic layers. The resulting effect is the development of different sound layers, which affect the listener's perception of rhythmic and harmonic elements. Some attack points become ambiguous and obscure, while at the same time some hidden harmonies are exposed. This creates a "kind of acoustic envelope generator, lengthening the release time of chords while simultaneously creating 'phantom' attacks" (Doll, 2007, p. 51). The distortion of the listener's perception present in Berio's music has captured the attention of researchers in the areas of music perception and comprehension of atonal music (Deliège, 1989; Imberty, 1993).

Nevertheless, distorted perception is not the only challenge that may hinder the encoding and retrieval of this piece. Another challenging aspect is the rhythm. Berio creates a mixture of all possible combinations of duplet and triplet rhythms with randomly placed rests and grace notes, thus affecting the performer's sense of the downbeat (Kim, 2014). The sense of free improvisatory style created by these irregular combinations may distort the performer's sense of structure.

5.2.3 Participants

Teachers from recognised higher education institutions in England and Portugal were asked to recommend postgraduate students capable of learning and memorising a short non-tonal piece with harmonic and rhythmic complexity. The author also contacted fellow postgraduate students with similar abilities. In total, three female and three male postgraduate pianists volunteered to take part in the study.[28] At the time, the pianists recruited were studying at the Royal College of Music (London, UK) and the Universidade do Minho (Braga, Portugal). The pianists were between the ages of 22 and 27. All musicians had busy performance schedules and were preparing for competitions and upcoming examinations in their teaching institutions.

[28] Pseudonyms are used to preserve anonymity for all of the performers.

No student had learned or memorised Berio's solo piano works. Only one student (Emma) reported performing a chamber music work by this composer. All participants in this study had previous experience in performing from memory. However, some reported performing non-tonal music with the score. Their previous experience with non-tonal repertoire also differed. Table 12 summarises information about the six participants, including their previous experiences with non-tonal music and memorisation. Three categories were used to represent how frequently the pianists performed non-tonal repertoire (Low – fewer than five pieces; medium – between five and ten pieces; and high – more than ten pieces).

Table 12. Participants' Demographic Information, Experience of Performing Non-tonal Repertoire and of Performing by Heart.

Participant	Gender	Age	Current Studies	Performance of Non-tonal Repertoire	Memorised Performances of Non-tonal Repertoire
Sophia	Female	22	Masters	Medium	None
Emma	Female	23	Masters	Medium	One
Mary	Female	22	Masters	Low	All
Andrew	Male	27	DMus	High	All, except when score is too complex
Harry	Male	23	Masters	Medium	All
Charles	Male	25	Masters	High	All, except when there is not enough time

The data collected from each pianist was quite extensive, with a total of 12 interviews, 87 video recordings (81 from practice sessions and six from memorised performances) and 30 annotated scores (18 from practice and 12 with reported PCs and structure). A detailed report of each case study was soon revealed to be unfeasible within the scope of this thesis. Therefore, from these six cases, three were

selected for in-depth analysis.[29] The selection criterion focused on accuracy of memorised performance. The final memorised performance was scored for accuracy using a method similar to that previously reported for the written recall test in Chapter 4. Each beat was scored for accuracy of pitch and rhythm. If pitch was correct, the score was 1; if incorrect or absent the score was 0. The same procedure was adopted for rhythm. These scores were used to compute the total percentage of accuracy for each participant (Table 13).

Table 13. Accuracy of Memorised Performance for All Participants.

Participants*	Accuracy of memorised performance
Sophia	99.39 %
Emma	100 %
Mary	98.17 %
Andrew	Asked to perform with the score
Harry	50 %
Charles	85.37 %

** Participants who were selected for detailed examination are highlighted in green.*

The pianists with the two most accurate performances were the first to be selected for in-depth analysis, in order to thoroughly examine the approaches leading to successful memorised performances. The cross-analyses of two case studies allow comparison of two effective approaches. Nevertheless, least successful cases were also considered to be relevant. The pianist with the least accurate performance spent a similar amount of hours practising the piece as the most accurate performance. A comparison between these studies provides the opportunity to explore what may have influenced the resulting differences in accuracy.

Case study 1: Emma was at the time a Masters student at Universidade do Minho, Portugal. She started studying piano at the age of nine and her training focused on repertoire of all styles. The pianist mentioned feeling a special connection with repertoire from the 20th century and a recent interest in composers from the end of the 20th and beginning of the 21st centuries. During her conservatoire studies she also premiered works of some student composers. Emma had played a chamber

[29] Future publications will report results for all six case studies.

music piece by Luciano Berio, but had never had contact with his solo pieces or other dodecaphonic music.

Case study 2: Sophia was a Masters student at the Royal College of Music. She started studying piano at the age of six and began her Bachelor studies very early, when she was 15 years old. Sophia's training was mainly based on solo and chamber repertoire from the baroque, classical and romantic periods. However, the year before this study she had her first contact with contemporary music, with weekly classes on this repertoire. In total she had performed six contemporary pieces, including music for prepared piano, but had never performed serial music or pieces by Luciano Berio.

*Case study 3:*Harry was at the time a postgraduate piano student in his first year of Masters in Performance at the Royal College of Music, in the UK. He started playing piano very young, about five years old. Although music was not initially his main career choice, he decided to do a Bachelor in piano performance at Trinity Laban. During this period, he developed a love for modern music and decided to focus his postgraduate studies on this type of repertoire. This was why he included a contemporary specialism as part of his masters in performance at the Royal College of Music. When Harry accepted to be part of this study, he had already performed a variety of American experimental repertoire, including pieces by George Crumb, Nancarrow, Ives Concord and Ornstein.

5.2.4 Procedure

This longitudinal multiple-case study followed a similar methodological approach to that reported in Chapter 4. All pianists were given the task of preparing Berio's *Leaf* for memorised performance within a period of one-and-a-half months. As all participants failed to meet the deadline, mainly due to other professional commitments, the performance date was delayed until they felt the memorisation process to be completed.

In order to preserve as much ecological validity as possible, participants were assigned a composition suitable for their ability level. Moreover, no boundaries were placed on the number and quality of practice sessions. The pianists were asked to video record all practice sessions with a personal device (e.g., phone, ipad, computer, video camera). For the three selected case studies, all practice sessions were later

transcribed using SYMP (see Chapter 4 for a detailed description). Data collected from the transcriptions in SYMP was used to compute the frequency and subsequently percentage of practice segments performed with left, right or both hands in different stages of learning, as well as from memory and with the score (see section 4.2.4.1).[30]

Throughout the learning process, retrospective and concurrent self-reports were collected to understand the thought processes, decision-making and strategies used during practice. Retrospective reports were collected through two semi-structured interviews, one before and one after the study. The first interview aimed at contextualising the pianist's subjective experiences of learning and memorising music, and used a similar interview schedule presented in Chapter 3 (see Appendix 2.1). The final interview addressed their specific experiences of learning and memorising Berio's *Leaf* (see Appendix 2.2). Both interviews were analysed using Interpretative phenomenological analysis (IPA), for the reasons provided in Chapter 2 (see Section 2.5.1). Concurrent reports were collected by asking the pianists to "think aloud" and comment on any pertinent aspects of the learning and memorisation process. Additionally, pianists were asked to annotate musical decisions on two different scores while practising.[31] If pianists were to engage in mental rehearsal, they were required to do so in front of the camera or, in case they felt uncomfortable, to write down the duration of the mental session and details about the content. After memorisation was complete, all pianists performed the piece by heart in a recital setting for their family and/or colleagues.

5.2.5 Data Analysis

The in-depth analysis of the three case studies selected included a mixed-methods approach, combining quantitative and qualitative methods of analysis. Table 14

[30] All pianists were asked to place the recording device in a position allowing to see their hands, face and score and to indicate when they were performing from memory and with the score.

[31] The first score was marked at the beginning of the learning period and changed close to performance. The initial intention was to ask them to make annotations on the score more often, but the performers noticed that the frequent change was disrupting their practice process. Therefore, because the other sources of data could also provide a clear picture of how their focus changed during practice, the pianists changed only score one time.

provides a summary of methods adopted to examine the different types of data collected.

Table 14. Summary of Data Analyses for Each Type of Data Collected.

Data Type	Source	Analysis
Semi-structured interviews	Interview 1 (before observation) Interview 2 (after observation)	Interpretative phenomenological analysis (IPA)
Musical decision reports	Annotated scores 1–2	Qualitative categorisation of musical decisions
PC and structure reports	Annotated scores 3–4	Qualitative categorisation of PCs and structural boundaries
Concurrent verbal comments	Video recordings	Content analysis
Practice records	Video recordings of physical practice	Cumulative records of practice using SYMP Quantitative computation – frequency of starts, stops and repeats for each beat during practice Multiple regression analysis relating practice measures with self-reports
Practice records	Video recordings of mental rehearsal	Thematic categorisation of strategies used
Performance	Video recordings	Scoring of recall accuracy during performance

The analyses of retrospective self-reports followed the same protocol described in Chapter 3 (see Section 3.2.4). The analyses of concurrent self-reports and practice behaviour followed the protocol described in Chapter 4 (see Section 4.2.4.2). In this case, analyses of thoughts during performance also considered spontaneous thoughts. Following the protocol proposed by Ginsborg et al. (2012, p. 209) "thoughts reported as having occurred during performance were classified as prepared PCs if they corresponded to a thought about a similar kind of feature at the same location in practice. Reports during the public performance that did not correspond to practice features were classified as spontaneous thoughts".

5.2.6 Ethical Approval

This study followed the British Educational Research Association (BERA) Ethical Guidelines and was reviewed and approved by members of the Conservatoires UK Research Ethics Committee at the Royal College of Music (Appendix 10.2). An information letter was given to all participants before the beginning of the study with detailed information about the research process, selection procedure and use/dissemination of collected data (Appendix 3). All participants were asked to voluntarily sign a consent form specifying their right to withdraw the study at any point. Anonymity of the participants was preserved by the use of pseudonyms and by not revealing any data that could potentially lead to their identification. Finally, all methods of inquiry and observation were non-invasive and low risk.

5.3. RESULTS

5.3.1 Case Study 1: Emma

Emma started learning Berio's *Leaf* in January of 2018. She explored the piece through one mental and three physical practice sessions. During the next month, Emma took a break from the study due to performance and teaching commitments. She resumed her practice of *Leaf* in March, when she deliberately focused on memorising it. From the moment she committed to memorising the piece, the process took less than one month. Table 15 presents a timetable with Emma's 19 practice sessions organised into three main learning periods, described below.[32] The table also indicates the musician's engagement with physical (PR) and mental rehearsal (MR). The pianist performed the piece on the 29th of March 2018, during a student recital at her university, starting with Berio's *Wasserklavier*[33] and ending with *Leaf*. The reports about thoughts during performance and musical structure were completed during the final interview, right after the memorised performance.

[32] The division into learning periods was based on the pianist's concurrent comments during practice and the final interview.

[33] *Wasserklavier* is one of Berio's *Six Encores*, a collection of short pieces including the one selected for this study. When accepting participation in this study, Emma decided to also learn some of the other encores.

Table 15. Timetable – Distribution of Practice Sessions and Final Performance, Organised into Three Stages of Learning, with Information About Date, Duration of Physical (PR) and Mental Rehearsal (MR) and Reports of Musical Decisions, Structure and PCs.

Learning Stages	Session	Date	PP (min)	MR (min)	Annotated score
Reading/Exploring	1	18/01/18	N/A	18	1
	2	19/01/18	21.24	N/A	
	3	20/01/18	6.38	N/A	
	4	26/01/18	36.45	N/A	
	Break				
Deliberate memorisation	5	05/03/18	N/A	15	
	6	06/03/18	51.43	N/A	
	7	06/03/18	34.14	N/A	
	8	17/03/18	54.31	N/A	
	9	18/03/18	21.47	N/A	2
	10	20/03/18	N/A	15	
	11	20/03/18	N/A	20	
	12	20/03/18	10.11	N/A	
Memory consolidation	13	22/03/18	N/A	5	
	14	22/03/18	22.25	N/A	
	15	22/03/18	7.47	N/A	
	16	23/03/18	1.15	N/A	
	17	24/03/18	21.40	N/A	
	18	25/03/18	11.29	N/A	
	19	27/03/18	7.44	N/A	
Memorised performance		29/03/18			
Final interview		29/03/18			Thoughts during performance and musical structure reports

5.3.1.1 Analyses of Self-reports

Retrospective Reports

As mentioned above, different types of self-reports were collected to grasp Emma's subjective experience of learning and memorising this piece. Retrospective reports were explored through IPA analysis of semi-structured interviews conducted before and after the study.

Emma's first semi-structured interview lasted 41 minutes. Four main superordinated themes emerged from the first interview and are described in Table 16.

Table 16. IPA Table, Emma's First Interview.

Superordinated Theme (Su.T)	Sub-Theme (ST)	Examples
Musical training	Previous studies	"I started studying music when I was nine, then studied in a music school, then went to Geneva to do the Bachelor and now I am doing my Masters" (E, p. 470, lines 3835-3836).
	Repertoire	"In academic settings, of course, we are required to play repertoire from all styles, but definitely the one I am more attached to is from the 20th century, not contemporary, but from beginning of the 20th century" (E, p. 470, lines 3840-3842).
Experiences with contemporary repertoire	Attitudes towards contemporary music	"Actually, in my case, I was drawn to like contemporary music. When I entered the conservatoire I had a teacher of musical analysis who really liked contemporary music. He was a composer and showed us a lot of contemporary music. He was completely passionate about it. Back then, already in high school, I also played a lot of music from my composer friends" (E, p. 476, lines 4092-4096).

	Contemporary music challenges	"In contemporary music I don't know very well how to memorise, I don't have references" (E, p. 471, lines 3868-3869).
	The performer of contemporary music: • Rhythmic and movement sensation • Energy • Imagination	"[…] we need to have much more rhythmic and movement sensation, somehow" (E, p. 476, 4076-4077). "I think they [performers of contemporary music] need to have energy. Your posture is somehow a little bit different, I think. I think it is more energetic than other music styles" (E, p. 475, lines 4073-4074). "We need to have more imagination to find meaning in the score, because there is the risk of becoming too simple, just strange" (E, p. 476, lines 4080-4081).
	Collaborations with living composers	"Back then, during high school, I already played music from my student composer friends" (E, p. 476, lines 4095-4096).
The choice of playing from memory	The repertoire factor	"I usually play from memory. Solo pieces almost always from memory, except when they are more contemporary. I think the only situations where I have not played from memory were precisely pieces from student composers" (E, p. 471, lines 3862-3864).
	Tradition of performing from memory	"[I play from memory] first because of standards, because usually people prefer to see pianists performing from memory" (E, p. 471, lines 3873-3875).
	The score is a distraction	"I prefer to play from memory because sometimes the score gets in the way, because I am not used to look at the score and because there are moments when I know from memory and others that I don't" (E, p. 471, lines 3877-3879).
	Benefits of performing from	"I think I listen better to what I am doing when I am playing

	memory: • Improved listening • Improved communication • Freedom	from memory. I can focus more on listening" (E, p. 471, lines 3874-3876). "Also, I think my expressive range increases a lot" (E, p. 471, line 3876). "But then also because I feel freer" (E, p. 471, line 3874).
Learning and memorisation approaches	Learning stages: • Preview • Work	"[…] the first thing I do is to always listen to a recording. This is basic, right? And while accompanying with the score. But then what I have done is not to start playing straight away, because I don't think that works very well. Before I start reading I always make sure I analyse the score, I define some things that I have to do and even the dynamics, phrasing. […] But I try to understand straight away the structure of the work, before I begin. […] Then I start playing. Normally I don't do a quick reading. Of course this varies, but most of the times I don't do a quick reading" (E, p. 472, lines 3915-3926).
	Segmentation strategies	"I start practising straight away by sections. I do the best I can for that section. I see each section in detail" (E, p. 472, lines 3928-3929).
	Mental practice	"Ah, and also one thing that I do a lot and now I have forgot to mention is to practice away from the piano. Because there are some passages that depend a lot on repetition, on our motor and technical dexterity and some times I get upset from repeating that infinitely and when I see that these things are relatively simple I do this practice away from the piano, on the table, for example, because then I try to avoid too much saturation in my practice" (E, p. 473, lines 3962-3967).
	Eyes closed	"And now I also try to study with my eyes closed. I have found that this works very well" (E, p. 472, lines 3936-3937).

Incidental and deliberate memorisation	"Well, this is also something that has been changing. There was a time when I tried to memorise straight away from the beginning and I think I continue doing this in relation to some pieces. Now I am not doing that, but I think that if I was playing romantic or even classical pieces I would do that. But because now I am playing more recent pieces I don't do that, although maybe that would not be a bad idea to do it. But yes, now I have more this concern of memorising after a certain point" (E, p. 474, lines 4025-4030).
Memory types: • Visual memory • Conceptual memory	"But then when memory problems arise I try to rely on visual memory of the keyboard, to imagine the keyboard […]" (E, p. 475, lines 4040-4041). "Each time more I memorise by using harmonic mnemonics" (E, p. 472, lines 3890-3891).

In this first interview, Emma spoke about her previous studies and repertoire previously performed. This data was used above to portray the participant. She also described her experiences of performing contemporary repertoire (namely collaborative experiences with living composers) and how her attitudes towards this repertoire have been shaped. When addressing specific challenges in this music, she mentioned the absence of references from her previous knowledge of music vocabulary and how this affects memorisation. Finally, she also identified rhythmic and movement sensation, energy and imagination as "must have" features for a performer of contemporary music.

Emma performs most of her repertoire by heart, except chamber music and contemporary solo pieces, mainly because she is not used to memorising this music and also because of the absence of tonal vocabulary. The reasons for performing the remaining repertoire by heart are, first, related to the tradition of performing from memory, but also to several benefits of performing without the score such as avoiding distraction, as well as improved listening, communication and freedom.

Finally, the pianist provided a general description of her approaches to learning and memorisation in different types of repertoire. She identified two main stages of

learning, beginning with a preview of the piece, followed by detailed work. During the work stage she follows a segmented approach, targeting specific sections. Emma also mentioned several times relying on mental rehearsal strategies, as well as practising with eyes closed. The pianist reported using a combination of incidental and deliberate memorisation. She had memorised deliberately from the very first stages of practice when she was younger, but recently and with more contemporary repertoire, she has chosen to think deliberately about memorisation after a certain point, usually after first reading the notes. Finally, she relies on different types of memory, namely conceptual or visual.

The relevant themes of this first interview will be further discussed below in comparison to the other sources of self-reports.

Emma's last interview was conducted immediately after the memorised performance of Berio's *Leaf* and lasted a total of 30 minutes. Three main superordinate themes emerged from the IPA analysis (Table 17).

Table 17. IPA Table, Emma's Final Interview.

Superordinate Theme (Su.T)	Sub-Theme (ST)	Example
Thoughts during performance	Prepared thoughts • Structural thoughts • Basic thoughts	"In terms of organisation [I thought] here a new phrase and here another new phrase" (E, p. 477, lines 4140-4141). "What I had more in my head was the soprano line, also sometimes also thought about the alto, but in general waht I thought was this soprano line because of the chromaticisms [sang]" (E, p. 477, lines 4134-4136).
	Spontaneous thoughts	"Then I thought more in terms of remedy than prevention. I was thinking that it was too loud and then I tried to do it more piano. I don't know if worked very, well, I don't remember anymore" (E, p. 477, lines 4142-4144).
Experiences throughout the study	Challenges faced with Berio's *Leaf*: • Rhythm • Reading • Less expressive	"[…] the piece has too many rests and it was a bit confusing" (E, p. 478, lines 4187-4188). "Of course the reading part was hard" (E, p. 479, line 4218).

		"It was challenging, because it is not a very expressive piece. I am not used to it" (E, p. 482, lines 4350-4351).
	Influence of research task	"It was weird, because I am used to have a lot of privacy. I think I felt a little bit. Sometimes I felt that I could not even think straight because I was being recorded" (E, p. 482, lines 4363-4365).
Learning and Memorisation Approaches	Learning stages	"First I listened to several recordings, I analysed the piece. I did this rhythmic thing on the score [see Figure 25], because the piece has too many rests and it was a bit confusing. So I wrote the location of the notes in the triplets and the semiquavers. I listened to it several times. Then I decided fingering. I studied more this last passage [bar 35]. And then memorise was part by part. And then in the end I was just working on little details that were arising in every place [laugh]" (E, p. 478, lines 4186-4191).
	Segmentation strategies	"In the beginning [I organised my practice] by systems, but then by phrases that I defined, which are those [pointed to the score with the marked structure]" (E, p. 480, lines 4256-4257).
	Search for structural meaning: • The process of structuring • Criteria for structural division • Structural interpretation	"[…] but I had the structure of the piece well defined before reading the notes, so I knew what I wanted" (p. 479, lines 4218-4219). "Well, actually I see here a structure that might not be too conventional" (E, p. 480, line 4262).
	Focus during practice: - Basic issues - Interpretative issues - Difficulties	"[I focused on] rhythm, especially rhythm" (E, p. 479, line 4202). "Then I made some decisions in terms of interpretation along the way, but not too official, they were changing" (E, p. 479, lines 4215-4217).

	"[I focused] more on this passage [bar 35]" (E, p. 479, line 4236).
Incidental and deliberate memorisation	"[I started memorising] after I had the piece more or less, when I could read it from the beginning to the end, with the score. So, with my fingers. There are people who memorise before this, but I haven't done this. Also because now I have been having memory problems. I wanted to know the piece first and then memorise " (E, p. 481, lines 4309-4312).
Memorisation cues: - Hand shapes - Melodic lines	"And then hand shape" (E, p. 481, line 4326). "It has been analysis, thinking about little voices" (E, p. 482, line 4343).

The pianist described the type of thoughts she had during performance, reporting a combination of prepared and spontaneous thoughts (see below for a detailed examination of thoughts during performance). She identified challenging aspects of the piece, such as reading difficulties and rhythm. Emma also provided a general overview of her learning and memorisation approaches to this piece. She described the learning stages, starting with a preview of the piece and reading it at the keyboard, moving to deliberate memorisation and concluding with overlearning. The pianist used a segmented approach to process the information and reported focusing on basic, interpretative dimensions and difficult passages. She also developed specific memory cues, such as hand shapes and melodic lines.

Concurrent Comments

During the learning process, Emma commented frequently on what she was doing and on the type of decisions made during practice. In total, Emma provided 411 comments to the camera. The content analysis of concurrent comments found 21 topics of comment, divided into five categories drawn from previous longitudinal case studies (Chaffin & Imreh, 2001; Ginsborg et al., 2006). Table 18 summarises the categories and respective topics found. The categories emerging from the analysis were the same as those reported in Chapter 4 (see section 4.3.2.2).

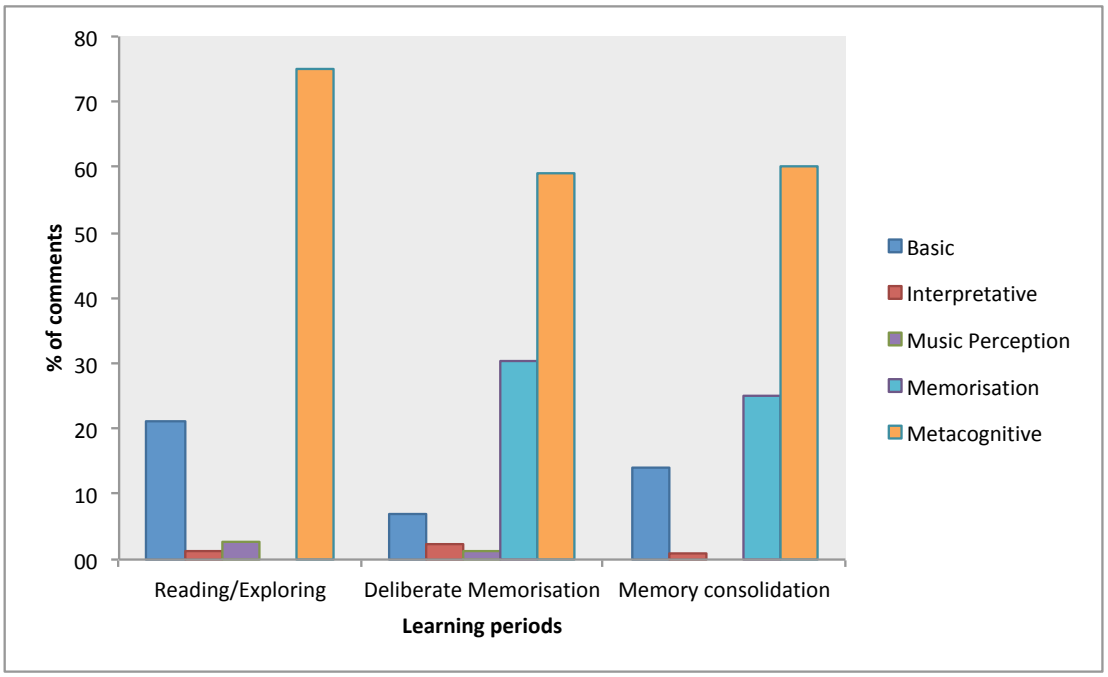
Table 18. Categories and Topics Used in Content Analysis of Emma's Concurrent Comments During Practice

Category	Topic	Example
Basic	Notes	"I will decipher the notes."
	Rhythm	"I was having difficulties with the rhythm. I was trying to do the first without appoggiatura and then with appoggiatura."
	Fingering	"Now I am in the first bar, I will keep finger three and not four."
	Hand Position	"I was just thinking about a chord that is not very comfortable, which is basically the penultimate chord of this bar where I have to place the hand in an uncomfortable position."
	Pedal	"Ok, I need to get used to play with the sustain pedal."
	Articulation	"I can't forget that the first semiquavers have an accent too."
Interpretative	Dynamics	"Faster decrescendo in the first bar of the last system."
	Sound Quality	"Here I can't forget that I need to play more in the soprano, in the tenutos fortissimo, sometimes the chord is too compact."
Music Structure	Associations	"Ah, here, it repeats the same notes, fortunately!"
	Structure	"Rhythms accelerating until the climax until the last bar in the penultimate system."
Memorisation	Memory Cues	"So first I play this first chord in the bass, then the second chord in the bass is this one and then I have these notes [B, F#, B flat], so it's all more or less B, F#, then E, E flat, then F# B."
	Remembering	"Sometimes I forgot about the B natural."
	Memorisation Attempts	"I will try to memorise the other two bars."
Metacognitive	Goals	"Now I will revise the last

	page."
Segmentation Strategies	"I will move on to the second system."
Practice and Memorisation Strategies	"I will try to play with my eyes closed to focus more."
Attention	"Sometimes I can't focus really well."
Difficulty Level	"Well, I need to do this several times because it is hard, is more difficult to internalise."
Evaluation	"The rhythm was wrong."

Practice was divided into three main learning periods based on Emma's concurrent (Table 18) and retrospective (Table 17) reports about the learning stages (see below for a more detailed description of the learning stages). The frequency of different categories of topic was calculated for each learning period. Figure 23 illustrates the evolution of comments across the learning process. The majority of comments were metacognitive. While talking to the camera, Emma frequently spoke about perceived difficulties, practice goals, practice structure and decision-making, as well as evaluation and monitoring of the learning process. After completing the first reading of the piece, the second most frequent topic of comment was memorisation. This is to be expected, because Emma's main goal was to memorise the music. Emma also commented from time to time on her understanding of associations between the musical elements and general structure in the first learning periods.

Figure 23. Percentage of Five Categories of Comment across the Three Learning Periods.



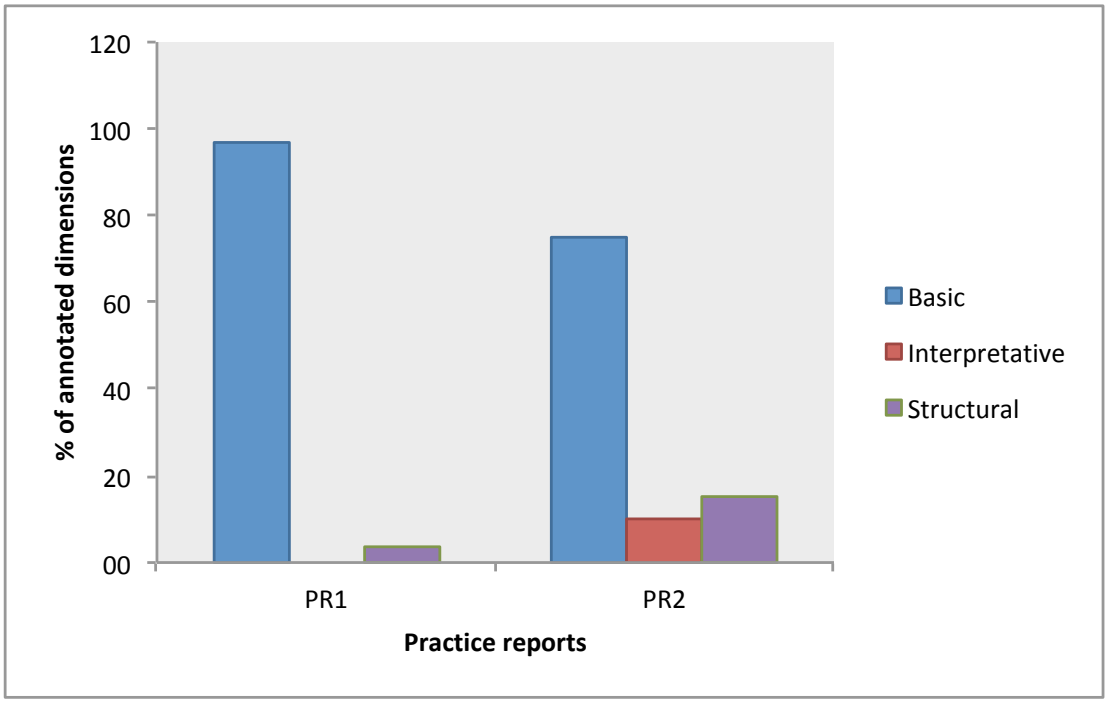
Basic issues received the third highest percentage in all learning periods. Although comments on basic issues decreased slightly during the second learning period, they rose again near performance, mainly because some basic elements, such as specific notes or rhythms, were still creating memory problems. Emma made very few comments on interpretative dimensions throughout all learning periods and they actually decreased in the last period. Moreover, she never mentioned expressive dimensions.

Annotations on Scores

Emma provided a total of 79 annotations in two practice scores (score 1, $n = 59$; score 2, $n = 20$). She also annotated structural boundaries and her thoughts during performance in two new scores delivered after the memorised performance. The analyses of practice scores found annotations of basic, interpretative and structural aspects of the music. Basic annotations included issues related to rhythm, notes, melodic contour, fingering, technical difficulties, articulation and hand shapes. Interpretative annotations referred only to sound quality. Finally, structural annotations indicated Emma's division of the piece into sections and subsections.

Figure 24 represents the percentage of this and other annotated decisions in two scores marked at the beginning and the end of the learning process.

Figure 24. Percentage of Different Categories of Annotations Marked in Two Different Scores at the Beginning and End of the Learning Process.



Basic issues remained the highest percentage of annotations in both scores. However, it is possible to note a slight decrease in this type of annotation, which gives rise to the emergence of interpretative markings in the second score. This result contradicts the analysis of the concurrent comments, which suggested a decrease of focus on interpretative issues in the last stage of practice. The divergence between the two sources indicates that even though Emma didn't comment so much on this dimension, she was still thinking about it while practising. This contradiction also highlights the importance of relying on different types of data sources to obtain a complete picture of the learning process. There was also an increase of structural annotations in the last score. In the first score Emma annotated the higher levels of structure and in the last score she divided those sections into smaller phrases.

Summary of Self-report Analyses

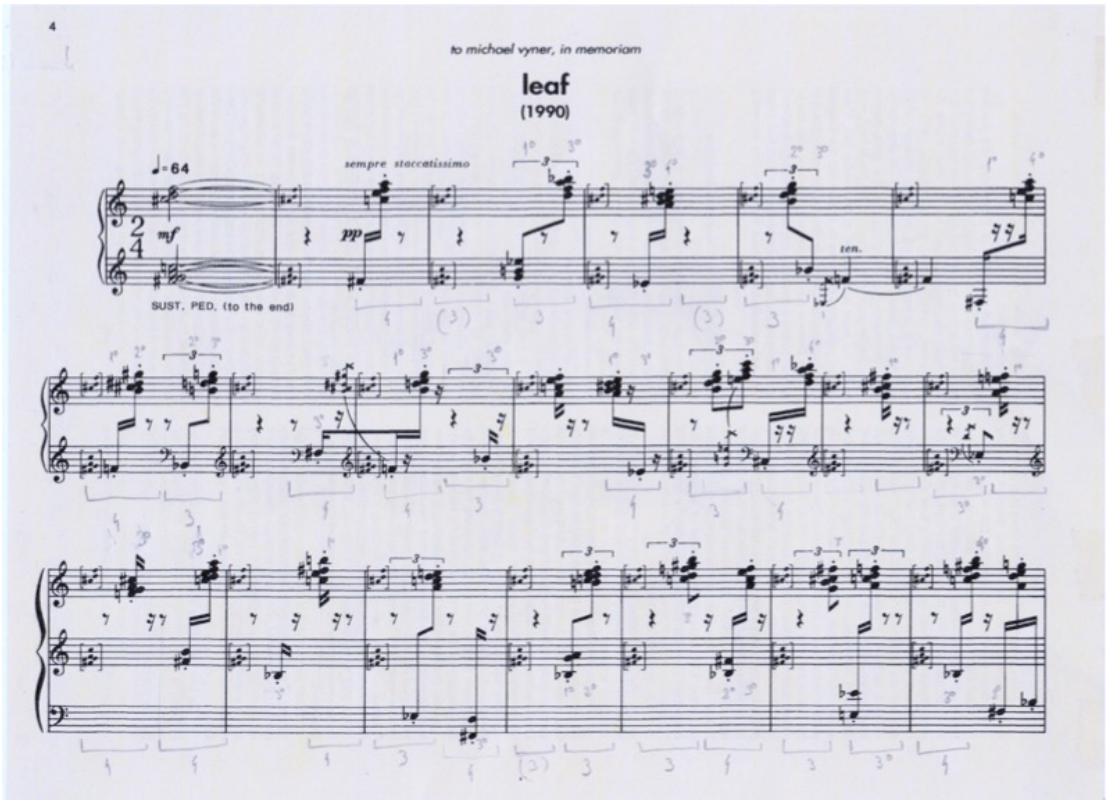
The analysis of concurrent and retrospective self-reports presented above provides the opportunity to understand Emma's approaches to learning and memorisation of this piece, as well as her focus during practice.

Learning Stages. Emma's concurrent and retrospective reports provide evidence of how she divided the learning process:

> First I listened to several recordings, I analysed the piece. I did this rhythmic thing on the score [see Figure 25], because the piece has too many rests and it was a bit confusing […] Then I decided fingering. I studied more this last passage [bar 35]. And then memorisation was part by part. And then in the end I was just working on little details that were arising in every place [laugh] (Final interview, p. 478, lines 4186-4191).

Emma began with a preview of the work in the first mental rehearsal session, before introducing physical practice. As reported in her practice diary for the first mental session, she started by analysing the score while listening to existing audio recordings in order to develop an overall idea of the piece. After the first preview, her subsequent step was to prepare the score for practice. She decided to simplify the visual representation of rhythmic elements by marking triplet and duplet subdivisions (Figure 25). The pianist indicated in brackets which rhythms followed a subdivision into four or three parts (below the staves), as well the location of the pitches within the rhythmic subdivision (above the staves).

Figure 25. Emma's Annotated Score After First Mental Practice Session.



After this first preview, she sat at the piano and started reading the notes: "I am going to try to decode the notes of every system now" (PS 1). After a break of one month, the subsequent sessions were more focused on deliberate memorisation. For example in Session 6 she mentioned her first deliberate intention to memorise: "Maybe I will try to memorise…" (PS 6). From this moment on the majority of remarks on practice goals included memorisation. In Session 14 Emma sat at the piano and attempted to play the piece by heart.After a run-through of the piece she commented: "Well, the parts that I confused the most were the coda, because of the appoggiatura and the end of the first page. So I will look at the score and continue practising the last part" (PS 14). This last period was dedicated to work on problematic and confusing passages and overlearning of the piece.

Segmentation strategies. According to Emma's concurrent and retrospective reports, she used a segmented approach to process Berio's *Leaf*. She memorised the piece by working on small amounts of information at a time: "Well, maybe I will try to memorise the first bars…memorise lightly, of course I know this won't remain

afterwards, but well, it's my first attempt. The first three bars plus the first note of the fourth bar" (PS 6). Moreover, she always monitored her fatigue levels and stopped practising every time she was feeling too overwhelmed or tired: "I am going to play once more and then I think I will stop and return a bit later, because I think it's better to do interpolated practice than practice in a row" (PS 17).

The pianist commented frequently on how she was segmenting the piece for practice. In the first learning period, she relied on visual layout, targeting systems: "Now I am going to do the second system again" (PS 2), or pages of the score: "Ok, once again I will review the last page" (PS 6). During this period, Emma also isolated difficult passages for extra practice. Bar 35, later named by Emma "the fateful bar", troubled her particularly during the first learning stages, as she struggled to properly perform this passage due to uncomfortable hand positions.

After the second learning period, Emma stopped using the score layout as the criterion to segment practice as frequently and reported using boundaries of her perceived structure of the piece as starting places: "And now I will start in the final section" (PS 16). Emma's comments suggest a progressive change of segmentation from the visual organisation of the score to her structural perception of the music. She also suggested this change of focus in the final interview (Table 17, p. 212).

Mental and Physical Strategies. In the first interview, the pianist acknowledged the importance of avoiding saturation throughout the learning process. This is why she not only works on small steps, but also combines different types of strategies, such as mental and physical rehearsal (Table 16, p. 208). This was exactly the approach she followed when working on *Leaf*. In total, Emma engaged in one hour and 13 minutes of mental practice and five hours and 11 minutes of physical practice (Table 15, p. 207).

According to Emma's reports of the mental rehearsal sessions, she focused first on listening and analysing the music in order to form a general idea of the *big picture* and prepare the score for practice. Later, at the beginning of the second learning period, mental rehearsal was used to track wrong notes and rhythms and to listen to the music in order to familiarise herself aurally with the resulting sound. In the last learning period, this type of practice consisted mainly of aural and visual imagery. The first consisted of imagining the music aurally, and the second of visualising the hands playing on the keyboard. This last strategy was used particularly in sections

causing memory problems. In one mental practice diary she wrote: "visualise the keyboard in sections where I had more problems, namely in the last bars of the first page and the last bar of the first system of second page" (PS 13).

In the physical practice sessions, Emma used varied problem-solving strategies to work on the difficulties encountered. When passages were too complex, Emma removed one musical layer: "I will just play without the rhythm" (PS 4). She also used a variety of techniques to solve technical issues, such as working with separate hands, playing backwards, slow practice, work with different rhythms, or playing with eyes closed.

The *eyes closed* technique was not only employed in challenging bars, but also as a way to increase concentration. Actually, the main purpose of playing with eyes closed was to confirm if memorisation was taking place: "Sometimes when I close my eyes it is to make sure that I am memorising, but, well of course, I can never…but it is just to have a vague idea" (PS 7).

Playing with eyes closed was often interspersed with direct visualisation of the keyboard. Emma wanted to ensure her practice would resemble the performance and this is why she practised looking at the keyboard: "Now, instead of playing with eyes closed I am looking at the keyboard; that makes more sense, because I will be looking at the keyboard when I play by heart, I won't be with my eyes closed" (PS 8).

The pianist also focused on developing cues to aid retrieval of specific parts. Several times she focused on specific notes, or on their accidentals. The melodies formed by the top or lower voices of the chords also became important cues. In the video recordings the pianist sang these melodies recurrently while playing. Emma also noticed the melodic contour of some melodies, such as their chromatic descending movement. Moreover, the metric location of the notes in the rhythmic subdivision was also an important cue: "Well, I can't forget that this is 1–3, then 1,2,3 then 3–4 [rhythm in the beginning]" (PS 14). Finally, Emma relied on visualisation of hand shapes on the keyboard. Actually, she mentioned in the first interview that this is a very useful strategy for this type of repertoire, as she usually finds useful to memorise in a "geometric" way:

> In contemporary music I don't always know how to memorise. I don't have those references and some times I memorise in a very geometric way, by focusing on the piano design or on the salience of black or white keys. I need to visualise that. I am not seeing a specific chord, a seventh chord, or inverted chord, so this is why I have more difficulties (First interview, p. 471, lines 3899-3903).

Focus on Basic Dimensions. In the first learning period, Emma's first concern was to work out the notes and rhythms in the score. Rhythm was frequent topic of comment, not only during the first learning period, but throughout the learning process. This dimension was also frequently annotated, particularly in the first score. In the final interview Emma emphasised that this dimension was not just challenging, but also an important feature of the music, which is why she focussed so much attention on it. In Session 8 Emma mentioned that rhythmic problems were one of the reasons for not initiating the memorisation process: "I am having some problems with the rhythm and this is why I am still not memorising" (PS 8). As the performance was approaching, the pianist also prepared what to think in order to perform some rhythms accurately: "Here in this triplet [bar 35] I need to always remember that is 1–2–3 [singing the rhythm]" (PS 17).

Emma occasionally mentioned issues related to pedaling or articulation, although the number of comments on these issues was very small. She actually noticed that practising with the pedal was important in order to become familiar with the resulting effect. In addition to the basic music elements implicit in the score, the pianist also commented on and annotated basic actions required to perform the music, such as fingering and hand positions. Comments on fingering were particularly frequent in the first learning period and decreased as practice progressed. Fingering decisions were mainly based on criteria of technical execution and comfort: "I am going to do the F # [bar 23] with the right hand, because I can't hold the D with the left hand" (PS 4).

Comments on hand position mainly referred to the distress felt in bar 35, as Emma struggled to find comfortable playing positions. Nevertheless, the pianist also noticed that she was recurrently playing wrong notes because of the hand positions she was using:

> Here I still do, in the third system of the first page I do, in the penultimate bar instead of doing E flat I am doing D several times and I don't know why. I am always wrong in this bar. Ah! I know! It's the hand position (PS 16).

In the first interview Emma mentioned that harmonic mnemonics had a crucial role in her memorisation approaches to tonal repertoire (Table 16, p. 208). Curiously, she did not attempt to develop harmonic mnemonics for this piece. This may be due to the absence of standard harmonic mnemonics readily available to associate with the new

information. Instead of spending time searching for a connection between the new chords and her previous knowledge, Emma decided to focus more on specific notes of the chords as cues to memorisation. These cues will be further discussed below.

Focus on Interpretative and Expressive Dimensions. In 411 comments over 18 sessions, Emma only commented eight times about interpretative issues and only marked two interpretative annotations in the last score. The majority of comments were on dynamics: "The decrescendo is faster in the first bar of the last system" (PS 13). The pianist only commented once on sound quality and this was one of her few interpretative annotations on the second score: "Here I can't forget that I need to do well the soprano, more soprano in the tenuto fortissimos, because sometimes the chord is too compact" (PS 17).

Besides the few comments on dynamics and sound quality, Emma hardly spoke about interpretation. She explained in the final interview that several interpretative ideas were decided in the first mental practice session while listening to existing recordings. She was also making interpretative choices as practice progressed, but those decisions were flexible. Nevertheless, the difficulty in reading the notes increased focus on basic issues:

> Then I made some decisions in terms of interpretation along the way, but not too official, they were changing. I cannot define that very well in terms of stages, because things just sort of develop, more or less. Of course the reading part was hard, but I had the structure of the piece well defined before reading the notes, so I knew what I wanted. (Final interview, p. 479, lines 4215-4219).

It is interesting to note that Emma never commented on expressive issues during the mental or physical practice sessions and did not mark any expressive issues on the score. However, in the final interview she mentioned thinking sometimes about the peaceful or agitated character of some parts, even though she didn't want to become too expressive, because this ephemeral piece was not supposed to convey much more than the simple falling of a leaf:

> […] because this is very ephemeral, right? So, if I started being too expressive with it this would not even make sense, this is ephemeral, like a leaf falling. So, in certain moments I thought, I will do this more *tranquilo*, or less. (Final interview, p. 479, lines 4225-4228).

Search for Structural Meaning. Throughout the learning process, Emma made only one comment on how she perceived the structure of the piece:

> Rhythms accelerating until the climax of the last bar of the penultimate system. Descending movement and abrupt decrescendo in the second cell of the first bar in the last system. Pianissimo subito and melodic coda in the last four bars. (PS 1)

The pianist was able to grasp the general structure of the piece in the first mental rehearsal session. She commented about this in the final interview: "I had the structure defined before reading the notes. So, I knew what I wanted" (Final interview).

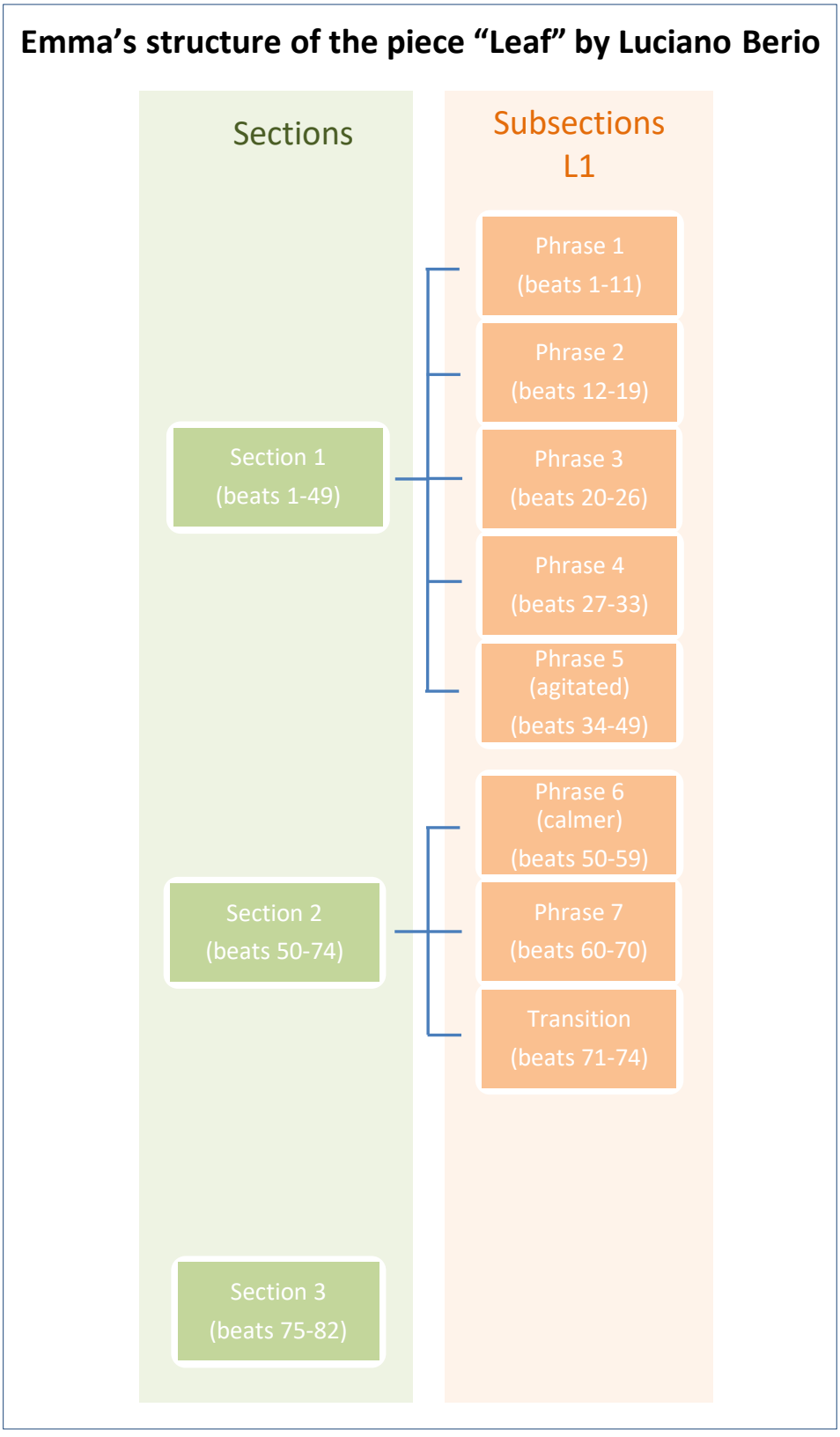
Although she did not comment more directly on musical structure in the subsequent session, it became clear that she was repeatedly trying to find a sense of coherence in the music. When she found similarities, she expressed relief: "Ah, here, ok [bars 33, 34], it repeats the same notes fortunately!" [laugh] (PS 4).

As practice progressed she developed a clearer idea of subsection divisions and marked them on the last score. In the final interview, Emma recognised that her perceived structure was not related to standard forms or based on theoretical models of analysis. She justified using this personal and unconventional division with the specific features of the music and her unfamiliarity with this type of repertoire:

> Now a teacher of musical analysis will come and will say, no, no, no, that's all wrong! [laugh] I am also not used to play this repertoire. But this is playful, despite everything. This piece is...of course there is always a sort of analysis that you have to do, but also there are a sort of carelessness (Final interview, p. 480, lines 4274-4277).

Emma was asked to mark her perceived structural division of the score on a new score in the final interview. She divided the piece into three main sections. Figure 26 illustrates a scheme of Emma's reported structure.

Figure 26. Musical Structure of Berio's Leaf, as Perceived by Emma.



Thoughts During Performance. Emma was the only pianist in the study who memorised and performed the piece with no pitch or rhythmic mistakes. In the final interview, she was asked to report, on a new score, everything she had been thinking about during memorised performance. After marking her thoughts on the score, the pianist was asked to describe and explain her performance experience. Emma reported not thinking too much during performance and to playing almost everything automatically. However, some cues were used to guide her retrieval of the piece during performance:

> Actually I didn't think about many things, it was more or less automatic. Basically what I thought was this [showed the score]. What I had more in my head was the soprano line, sometimes also thought about the alto, but in general what I thought was this soprano line because of the chromaticisms [sang]. So this type of things to know where I was. Then, right at the beginning, I thought about these three beats, which is something that sometimes I was playing and I didn't know where I was. Also because it was the beginning and it is harder to be more focused […] In terms of organization [I though] here a new phrase and here is another new phrase. And then, the only thing I thought in terms of memory was to do D in this part and E flat instead of E (Final interview, p. 477, lines 4133-4142).

According to Emma's description, the top notes of the chords were used to help keep track of where she was during performance. As previously mentioned, she frequently sang these specific notes while practising, thus suggesting that she was preparing these cues for performance. She also mentioned thinking about rhythm in the beginning. Besides detailed music elements, Emma also thought in structural terms, namely focusing on specific phrases of her perceived structure.

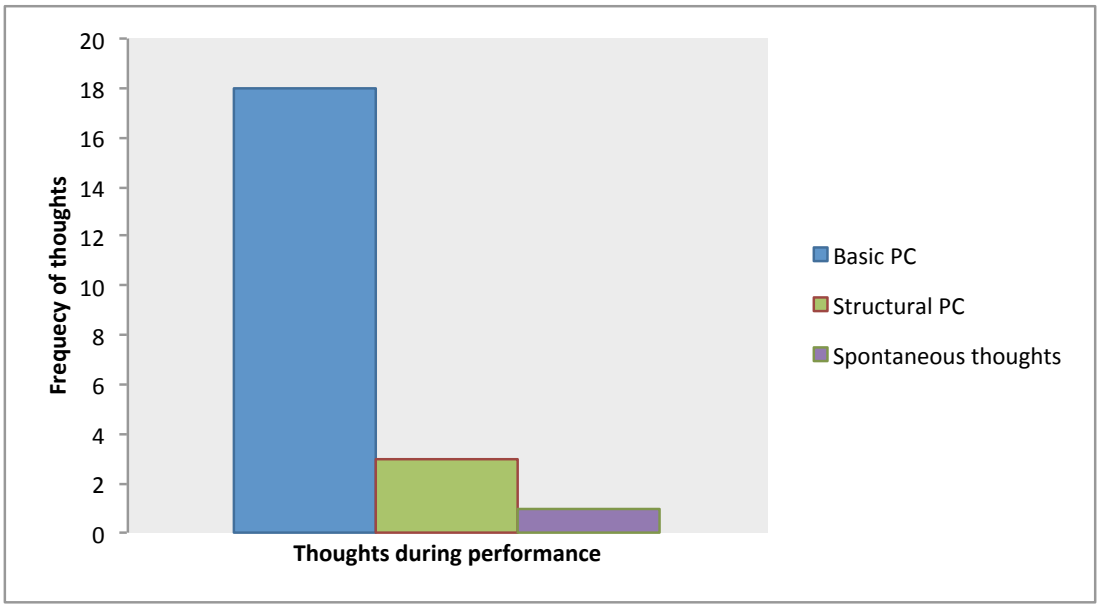
Overall, Emma thought about basic and structural cues during performance. In the final interview Emma also reported thinking expressively, but this was related to the general character she was giving to the piece, not to specific expressive moments that could serve as cues to monitor performance. Besides the basic and structural cues that have been previously prepared in practice, Emma also had one spontaneous thought during performance, related to sound perception:

> Then I thought more in terms of remedy than prevention. I was thinking that it was too loud and then I tried to do it more piano. I don't know if worked very, well, I don't remember anymore (Final interview, p. 477, lines 4142-4144).

In total, Emma marked 22 thoughts on the score after the memorised performance. Figure 27 represents the frequency of different types of prepared PCs and spontaneous thoughts. Basic PCs included the notes of the soprano or contralto voice, which served as cues to track where she was as the performance progressed, as well

as some rhythms and one technical issue. Structural PCs included beginnings of phrases.

Figure 27. Frequency of Different Types of Thoughts During Memorised Performance.

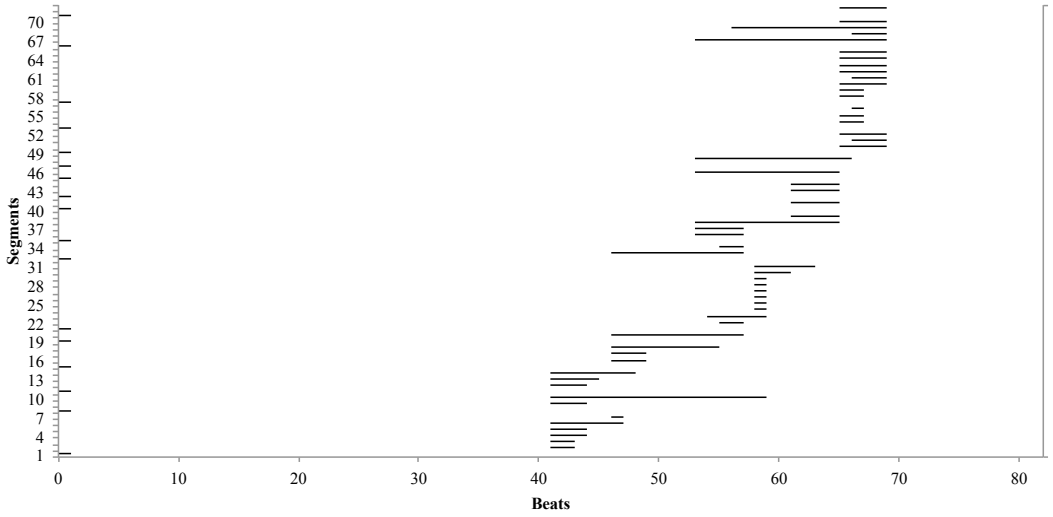


5.3.1.2 Analyses of Practice Behaviour

In order to provide a more comprehensive analysis of the learning process, all video recordings were transcribed using SYMP (see Chapter 4 for a detailed description of the process). The video recordings of the physical practice sessions were divided into three sets, according to Emma's description of learning stages: (1) *Exploring* (Sessions 2–4); (2) *Deliberate Memorisation* (Sessions 6–12); and (3) – *Memory Consolidation* (Sessions 14–19). Sessions 1, 4 and 13 consisted solely of mental rehearsal and were not included in the analyses.

Learning Period 1. According to the analysis of the video recordings, practice at this stage focused on small segments (Figure 28).

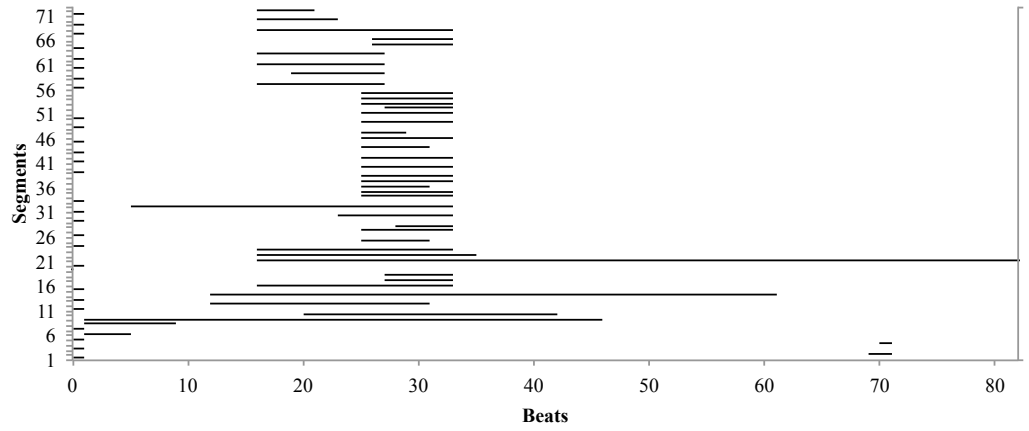
Figure 28. Practice Graph from Session 4.



During this period she practised mainly with hands together (88.4%). Only 11.6% of practice segments were performed with separate hands (6.8% with the right hand and 4.8% with the left hand). According to her concurrent and retrospective comments, the main concern at this stage was not to memorise. As expected, practice was mainly performed with support from the score (89%), with only 11% carried out without looking at it. These segments were mainly located in the difficult parts of the piece, which required visual focus on the keyboard in order to be accurately performed.

Learning Period 2. Practice at this stage was interspersed between shorter and longer segments (Figure 29).

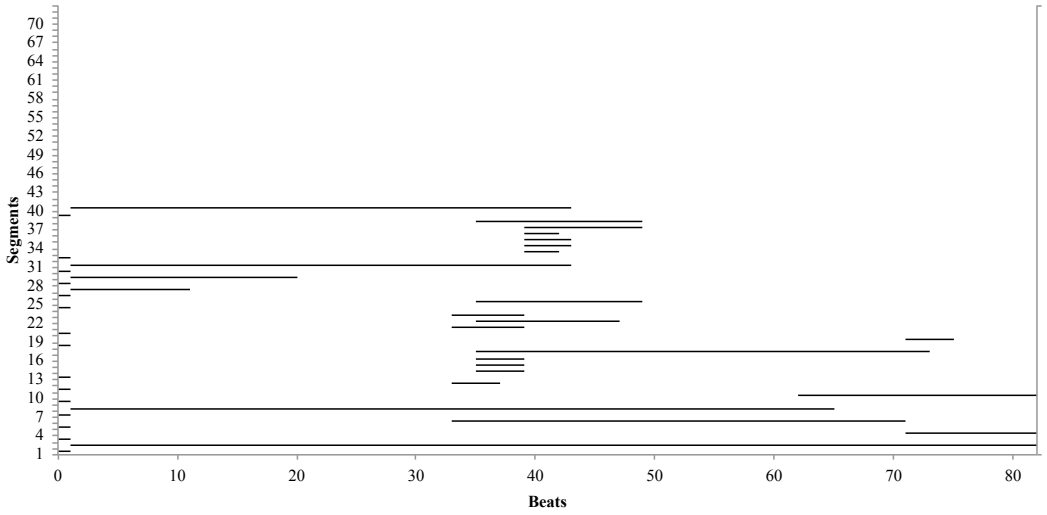
Figure 29. Practice Graph from Session 6.



At this stage, the majority of physical practice was performed with hands together, with only 2.9% of segments performed with the right hand and 0.4% with the left. Practice was mostly performed without looking at the score (74.3%), either by focusing on the keyboard, turning over the score or playing with eyes closed.

Learning Period 3. As mentioned above, Emma's first run-through of the piece by heart was in Session 14, as illustrated by the practice graph of this session (see bottom line, Figure 30).

Figure 30. Practice Graph from Session 14.



At this stage she continued working on small fragments but increasingly focused on wider sections of the piece. She always practised with hands together (100%). The majority of practice was performed without looking at the score (95.7%).

Relationship Between Emma's Reports and Practice Behaviour. Multiple regression analyses assessed the relationship between Emma's reports with her practice behaviour. Following the procedure reported in Chapter 4 (see section 4.3.3), nine

predictors were extracted from Emma's self-reports (see Table 19).[34] Emma's structural perception of the piece was chosen as the first predictor, in order to assess whether structure would have a significant role in the retrieval scheme. Because her reports also suggested a segmentation of practice based on boundaries of the page layout, they were also included. Finally, a basic PC used to monitor technical execution was also considered as a predictor.[35]

Tables 19, 20, and 21 present the regression coefficients for the effects of different predictors on starts, stops and repeats in each practice session set, respectively. The different regression models accounted for between 24% and 97% of the variance. The only model not statistically significant was the multiple regression with repetitions from the second period as dependent variable. Out of the 81 potential effects of predictor variables, 11 were significant at the p<.001 level, 7 at the p<.01 level and 1 at the p<.05 level.

Table 19. Regression Coefficients (Unadjusted) for the Effects of Structural Boundaries, Score Layout and Difficult Passages on the Number of Starts in Each Practice Session Set, with R^2.

Starts

Learning Phase	1. Reading	2. Deliberate Memorisation	3. Memory Consolidation
Structure			
Section – Beginnings	3.18	3.33	7.37**
Section – Ends	-3.82	-2.34	-0.96
Subsection – Beginnings	-1.84	13.42***	6.29**
Subsection – Ends	-1.42	-0.37	-0.16
Page Layout			
Pages – Beginnings	29.18**	6.67	1.04
Pages – Ends	-3.82	-2.34	1.04
Systems – Beginnings	22.14***	-0.69	1.47
Systems – Ends	0.10	-3.85	-1.99
Difficulty			
PC Basic/Difficulty	272.18***	14.67	28.04***
R^2	**0.90*** **	**0.24***	**0.47*** **
***** p<.001, ** p <.01 * p<.05**			

[34] All predictors presented non-significant correlations (r < .18). The reported structural PCs were not separated from musical structure in this model because the significant agreement between both dimensions could affect the results of the regression model.

[35] Emma also reported thinking about the top note of every chord. However, since this description relates to every beat of the piece, these notes were not considered for the regression model.

Table 20. Regression Coefficients (Unadjusted) for the Effects of Structural Boundaries, Score Layout and Difficult Passages on the Number of Stops in Each Practice Session Set, with R^2.

Stops

Learning Phase	1. Exploring	2. Deliberate Memorisation	3. Memory Consolidation
Structural boundaries			
Section – Beginnings	-3.02	-1.66	-1.11
Section – Ends	2.99	13.34***	12.89***
Subsection – Beginnings	-4.55	0.73	-0.81
Subsection – Ends	1.06	9.94**	-0.03
Page layout			
Pages – Beginnings	-2.02	1.01	3.89
Pages – Ends	38.99***	4.01	-1.11
Systems – Beginnings	4.62	0.33	-0.41
Systems – Ends	14.61***	-2.66	-0.40
Difficult passages			
PC Basic	330.99***	26.01***	40.89***
R^2	**0.97*****	**0.39*****	**0.77*****

***** p<.001, ** p <.01 * p<.05**

Table 21. Regression Coefficients (Unadjusted) for the Effects of Structural Boundaries, Score Layout and Difficult Passages on the Number of Repeats in Each Practice Session Set, with R^2.

Repeats

Learning Phase	1. Exploring	2. Deliberate Memorisation	3. Memory Consolidation
Structural boundaries			
Section – Beginnings	-10.58	-17.09	-7.98
Section – Ends	-11.58	-7.42	-1.98
Subsection – Beginnings	-11.63	7.67	1.18
Subsection – Ends	-6.22	8.82	-5.85
Score layout			
Pages – Beginnings	8.09	24.25	41.36**
Pages – Ends	17.09	21.25	39.36**
Systems – Beginnings	20.74**	6.33	-3.94
Systems – Ends	13.55	1.12	-5.97
PC Basic	316.09***	3.25	30.36*
R^2	**0.87*****	**0.07**	**0.25****

***** p<.001, ** p <.01 * p<.05**

The significant effects emerging from the analysis are all positive, indicating that Emma started, stopped and repeated more structural and score layout boundaries and difficult bars requiring attention to technique. Table 22 summarises the significant effects found in these analyses.

Table 22. Summary of Significant Effects (p<.01*) of Structural Boundaries, Score Layout and Difficult Passages on the Frequency of Starts (B), Stops (E) and Repeats (R), with Effects on Starts Highlighted and Effects on All Three Measures at the Same Time in Bold Italics.

Learning Phase	1. Reading/Exploring	2. Deliberate Memorisation	3. Prepare for Performance and Memory Consolidation
Session set	1–4	5–8	9–14
Structure			
Section – Beginnings			B
Section – Ends		E	E
Subsection – Beginnings		B	B
Subsection – Ends		E	
Score layout			
Pages – Beginnings	B		R
Pages – Ends	E		R
Systems – Beginnings	BR		
Systems – Ends	E		
Difficulty			
PC Basic/Difficulty	**BER**	E	**BER**

**Effects on starts, stops and repeats that were significant at the p < .01 are shown in capital letters while effects at the p <.05 levels are represented by lower cases b, e and r.*

In the first learning period, Emma organised her practice mainly around the score layout, starting and stopping mostly on page and systems boundaries. The beginnings of systems were also repeated more consistently than other locations. This result corroborates Emma's concurrent comments, as she reported structuring her practice around the boundaries of the score layout during this period.

The regression analysis also found simultaneous effects for starts, stops and repeats for a basic PC Emma had developed to work in bar 35, which had troubled her during learning. This PC consisted of a specific hand position important to technically perform the passage.

Once again, in accordance with Emma's comments, the analysis clearly shows how this location was singled out for practice, working consistently as a starting and

stopping place and receiving extra practice in relation to other locations. This location was mainly singled out in the first learning period and near the performance. Nevertheless, it appeared to continue causing problems in the second learning period, as Emma continued stopping more in this specific bar.

It is interesting to notice that, although the pianist was aware of the general structure of the piece from the start, she only used this understanding after memorisation became the main focus of attention. This result corroborates her self-reports discussed above. In the first stage, Emma decided to divide the piece into major sections, but not into specific phrases. This appears to be why she worked first on specific systems of the scores, because she hadn't clearly defined the detailed division into phrases, but still preferred to work on small segments. In the second and third learning periods, the effect of score layout on starts and stops disappears and gives rise to subsection boundaries (phrases) and later to a combination of subsection and section boundaries. The only effect of score layout in the last learning period is on repetitions.

These results provide strong evidence that Emma organised her practice around her understanding of musical structure. Initially, she also used the score layout as a criterium for segmentation, but when memorisation became the main goal, she used her own structural boundaries more often as starting and stopping places. In the second learning period she focused more on the lower levels of structure (phrases) and in the last period on the higher levels (major sections).

5.3.1.3 Summary

Emma memorised Berio's *Leaf* in a period of three months, with a one-month break between. After 14 sessions of physical practice and five of mental rehearsal, she was able to perform the piece with 100% accuracy. Usually she doesn't perform non-tonal repertoire by heart, because it doesn't contain tonal patterns and she is not used to do it. Nevertheless, she was able to accomplish this task successfully. She started the learning process with an aural and notational overview of the music (Mishra, 2005). At this stage she also prepared the score for practice, marking the rhythmic subdivision in detail. She then moved on to explore notes and rhythms on the keyboard. After Session 6, memorisation became the main practice goal. After

Session 14, she was able to perform it by heart but still felt the need to continue overlearning the piece and solving problematic passages.

Emma memorised Berio's *Leaf* using a segmented approach (integrating smaller and larger segments). During the first learning period, the pianist reported relying on the score layout to segment practice and isolate difficult bars. The analysis of practice behaviour confirmed these reports, indicating that she was starting and stopping more on pages and system boundaries than other locations, as well as in difficult bars. However, the search for structural meaning was also very important for Emma, as she recurrently grasped for a sense of coherence in the piece. She developed an overview of musical structure in the very first practice session, while analysing and listening to the music. The subsection boundaries were worked out later on. These structural divisions were very personal and not related to compositional rules. After the second learning period, Emma reported focusing more on her own structural division. The analysis of practice behaviour confirms this claim, as Emma used her subsection boundaries to organise practice while deliberately memorising the music. Later on, she interspersed subsection and section boundaries. After the performance, she actually reported thinking about some of these structural landmarks, as well as the basic issues of the piece.

Emma used a combination of physical and mental rehearsal to memorise this piece. Mental rehearsal was used to acquire a general overview of the music, as well as to aid memorisation. The pianist relied on different forms of mental rehearsal, such as structural, aural, visual and kinaesthetic imagery. Physical practice incorporated problem-solving strategies, such as removing musical layers, working with separate hands, playing backwards, slow practice, or working with different rhythms. She also practised repeatedly, with eyes closed, to work on technical issues and concentration, but also to ensure memorisation was taking place. The pianist also developed cues to aid memorisation, namely, focusing on basic aspects of the piece (notes, accidentals, melodies, melodic contour, rhythm and hand shapes). Emma focused much more on basic issues than interpretative and expressive ones throughout the learning process. She actually mentioned in the final interview that she considered the piece to be more ephemeral and not too expressive.

These results strongly suggest that Emma used a hierarchical retrieval structure to encode and retrieve this piece, as predicted by previous research (Chaffin et al., 2002; Williamon & Valentine, 2002).The structure developed was organised around

Emma's understanding of musical structure and basic PCs. These results will be further discussed in Chapter 6.

5.3.2 Case Study 2: Sophia

Sophia memorised *Leaf* in a period of three months. The 25 video-recorded practice sessions lasted a total of 15 hours.[36] She was, by far, the participant who had spent the most time learning and memorising this piece. However, it is important to note that she had fewer performance commitments than the other pianists during the study period. Table 23 presents a timetable with the 25 sessions organised into three main learning periods which will be described below.

Table 23. Timetable with Distribution of Practice Sessions and Final Performance, Organised into Three Stages of Learning, with Information About Date, Duration of Physical (PR) and Mental Rehearsal (MR) and Reports of Musical Decisions, Structure and PCs.

Learning Stages	Session	Date	PR Duration (min)	MR Duration (min)	Annotated score
Exploring	1	7/12/17	49.53	2.6	1
	2	17/12/17	44.08	1.12	
	3	18/12/17	40.68	0.32	
	4	19/12/17	26.30	N/A	
	5	21/12/17	28.29	N/A	
	6	26/12/17	29.43	N/A	
	7	27/12/17	38.51	0.62	
	8	28/12/17	35.35	N/A	
	9	2/01/18	35.05	0.45	
	10	3/01/18	31.21	1.17	
	11	5/01/18	36.97	0.32	
	12	7/01/18	42.22	N/A	
Consolidate memory	13	14/01/18	34.19	0.23	2
	14	15/01/18	45.56	N/A	
	15	17/01/18	38.85	0.4	
	16	18/01/18	39.13	N/A	
	17	22/01/18	40.45	N/A	

[36] Sophia recorded 26 sessions, but one of the video recordings was not possible to analyse because the video file was corrupted after download. Sophia reported always practising with the video camera on.

	18	24/01/18	31.08	0.4	
	19	27/01/18	25.22	N/A	
Interpretative	20	28/01/18	34.22	N/A	2
	21	29/01/18	38.45	N/A	
	22	31/01/18	59.17	N/A	
	23	8/02/18	43.47	N/A	
	24	9/02/18	18.58	N/A	
	25	12/02/18	6.18	N/A	
Memorised performance	12/02/18	12/02/18			

The pianist performed the piece on the 12th of February 2018 for friends and colleagues, and was immediately interviewed about her thoughts during performance and other issues related to her learning and memorisation process.

5.3.2.1 Analyses of Self-reports

Retrospective Reports

Sophia's first interview lasted 45 minutes. Table 24 presents the five superordinate themes emerging from the IPA analysis and common to all case studies, as well as the respective sub-themes.

Table 24. IPA Analysis, Sophia's First Interview.

Superordinate Theme (Su.T)	Sub-Theme (ST)	Examples
Musical training	Previous studies	"I started studying music when I was four, playing the violin. I started piano when I as six years old, then entered the conservatory at seven and until then I have been studying the piano a lot" (S, p. 483, lines 4398-4400).
	Repertoire	"Usually, in all my short life, I have played classical repertoire from Bach to Mozart, Beethoven, Haydn, Rachmaninoff" (S, p. 483, lines 4405-4406).
Experiences with contemporary music	Attitudes towards contemporary music	"In the beginning I was a little bit sceptical about this assignment. I thought that they had just put it there to make credits. But then the teacher was really good. I enjoyed it and I

		kind of like it more" (S, p. 490, lines 4671-4674).
	Contemporary music challenges	"I played one [contemporary piece], it was prepared piano. So I only could practice when I was with a teacher, because it wasn't in my home, so I didn't have a piano to place the objects" (S, p. 486, lines 4512-4513).
	The performer of contemporary music: • Knowledge of tonal music • Trained ear	"So in the end I think, you need a basic knowledge of tonal music, to be able to forget about it and play that. I don't know, because I don't know any case of someone who doesn't know any music who tried to play contemporary music. But I think it would be really difficult, because it's crazy, notes everywhere" (S, p. 489, lines 4647-4651). "A good ear. Not absolute pitch, but a trained ear. Because there are a lot of jumps, usually, dissonant harmonies" (p. 489, lines 4644-4645).
The choice of playing from memory	The repertoire factor	"Ah, one thing that I didn't say was that in the contemporary music, I played with the score" (p. 488, lines 4604-4605).
	The score is a distraction	"So, in the end, it is better without the score because you get distracted sometimes" (p. 484, lines 4445-4446).
	Improved communication	"When you play from memory, the advantages are: probably you are focusing on maybe what that piece means to you; maybe emotionally you are trying to communicate and you focus on what you want to say with the piece you have learned before" (p. 485, lines 4453-4456).
Learning and memorisation approaches	Learning stages	"First of all, I try to see how the piece is structured. There are maybe some similar parts in the piece, exact parts. Maybe the same part is transposed. When I get the structure, I then focus by segments […] I try to decide fingerings first. And then I try to understand what's happening,

	the direction of the phrases, if they use phrases at all, the dynamics. Then I try to find the emotional content of it" (S, p. 485, lines 4465-4470).
Segmentation strategies	"So I work by segments. Maybe then I go to other segment, then go back to first one and this way" (S, p. 485, lines 4467-4468).
Incidental vs deliberate memorisation	"[I start memorising] at the beginning. When I'm learning, trying to understand the piece, I try to understand how to play it without the score. When I was little, memory scared me a lot, so I worked a lot on that. I'm always trying to understand the piece, how to play it from memory" (S, p. 487, lines 4557-4560).
Memory cues and landmarks	"[I] try to find some cues to help me memorise and try it again" (S, p. 487, lines 4577-4579).
	"You can have cues just to make sure where you start and where you finish. And even if something happens in the middle, you fail some notes or you just miss a jump in the left hand, you can continue listening to the harmony because usually it is second, dominant, tonic in a lot of tonalities" (S, p. 485, lines 4485-4488).
Singing	"I sing a lot. I sing before I play, and then I try to play what I sang, when there [are] a lot of voices. I also try and sing internal voices" (S, p. 487, lines 4574-4576).

During this first interview, Sophia mentioned one assignment on contemporary music that she had taken a year before the current study. The pianist started by reflecting on her attitude towards this type of repertoire. She noticed how it had changed from initial scepticism to acquired attraction and acknowledged the role of her teacher during this process. Regarding the challenges faced when learning this music, she mainly referred to practical limitations of not being able to practice on every piano

when learning music with extended techniques. She considers that the performance of this type of repertoire requires knowledge of tonal music and a trained ear.

Sophia started the interview stating that she performs all repertoire by heart, but later on remembered that she performed contemporary music with the score. Her choice was not due to preference, but to the challenges faced when memorising this music. In general she prefers to play from memory because she considers that the score can become a distraction on stage and because she wants to focus on expressing the music to the audience.

Regarding learning and memorisation approaches, Sophia provided a general overview of her learning stages, beginning with a preview of the musical structure, followed by detailed work and concluding with a new search for interpretative and expressive understanding. Such stages affect the segmentation strategies used, as Sophia relies on segmented approaches when working in detail and on integration of those segments when focusing on interpretative and expressive dimensions. The pianist starts memorising deliberately right away, mainly due to a fear of memory failure developed during her childhood. She also uses techniques such as singing to aid memory and develops different types of cues and landmarks to serve as recovery

The final interview lasted a total of 50 minutes. The three common superordinate theme emerging from the IPA analysis (Table 25) will be now briefly summarised.

Table 25. IPA Analysis, Sophia's Final Interview.

Superordinate Theme (Su.T)	Sub-theme (ST)	Example
Thoughts during performance	Prepared thoughts: • Structural thoughts • Basic thoughts • Expressive thoughts • Spontaneous thoughts	"[…] then in this part I tried to think about more in terms of structure, so I thought about three closures. I didn't think about the first one, so that's why I just wrote the second and the third, but I realised like 'Oh, I have to think about it'" (S, p. 491, lines 4716-4719). "[…] here I thought about the movement of the chords" (S, p. 491, lines 4711-4712). "I always think that I have to maintain the tension here" (S, p. 491, line 4712). "I thought that I did this F sharp

		too loud and I kept thinking about that" (S, p. 491, lines 4712-4713).
Experiences throughout the study	Feelings during practice • Felt lost • Felt tired	"I remember that in the first rehearsal, the first practice sessions, I was a little bit lost, trying to understand some things" (S, p. 491, lines 4743-4744). "I remember, I got really tired, so I couldn't do more than 40, 45 minutes" (S, p. 491, lines 4744-4745).
	Influence of research task	"It was really interesting. I realised when you have to record yourself, you don't want to do any more than necessary. So it was really good to realise that I wasn't able to do more than fourty five minutes at most" (S, p. 496, lines 4922-4924).
Learning and memorisation approaches	Segmentation strategies	"So I was working on little sections" (S, p. 491, line 4744).
	Search for structural meaning • The process of structuring • Criteria for structural division • Structural interpretation	"So in the beginning I was feeling like this [a bit lost] and then, as time progressed, I was starting to be aware of some little sections and I tried to organise in terms of structure" (S, p. 491, lines 4746-4748). "For example, in the big sections, I was trying to divide them in little sections of three parts, usually. Maybe some sections have five" (S, p. 492, lines 4751-4752). "So in terms of structure, the first bar, I think at the beginning we have this atmosphere chord. Then from here, I start counting. So this was the first little section [after the atmosphere chord]" (S, p. 495, lines 4902-4903).
	Incidental vs deliberate memorisation	"I don't remember exactly when I started, but I think I always tried to do it from the beginning" (S, p. 494, lines 4859-4860).
	Memorisation cues and	"Also other thing I continued

	landmarks • Melodic contour • Rhythm • Expressive cues • Structural landmarks	doing was to go up and down with the voices, like the movement of the soprano" (S, p. 493, lines 4829-4830). "This part was the beautiful part. So at the beginning I was trying out several memorisation techniques. So I was trying to, maybe counting, maybe the movements, and thinking about more beautiful or emotional things that might be helpful" (p. 493, lines 4822-4825). "I tried to, because one of my teachers always said to find points. If you're lost, go to that point. I didn't make it really consciously. There were several parts where I knew exactly where to start in the beginning of the sections. I knew if I got lost here, I knew exactly where to start here" (p. 494, lines 4865-4871).

Similarly to Emma, this pianist reported a combination of prepared and spontaneous thoughts during performance. Regarding the learning process, she spoke about how she felt lost and tired during the process, particularly in the first learning stages. She didn't feel she was affected by the research task and actually saw benefits in recording her own practice. Sophia also relied on a segmented approach to practice and emphasised the importance of finding structural meaning in the piece. Memorisation began right away and relied on the development of different types of memory cues and landmarks.

Concurrent Comments

Sophia provided 1558 comments to the video camera. A total of 29 topics emerged from the content analysis and were allocated into six categories (Table 26). The topics were very similar to the ones reported above for Emma's comments. Nevertheless, because this pianist frequently commented on perception of sound, associations and structural relationships between the musical elements, the category of music structure was expanded and labelled *music perception*.

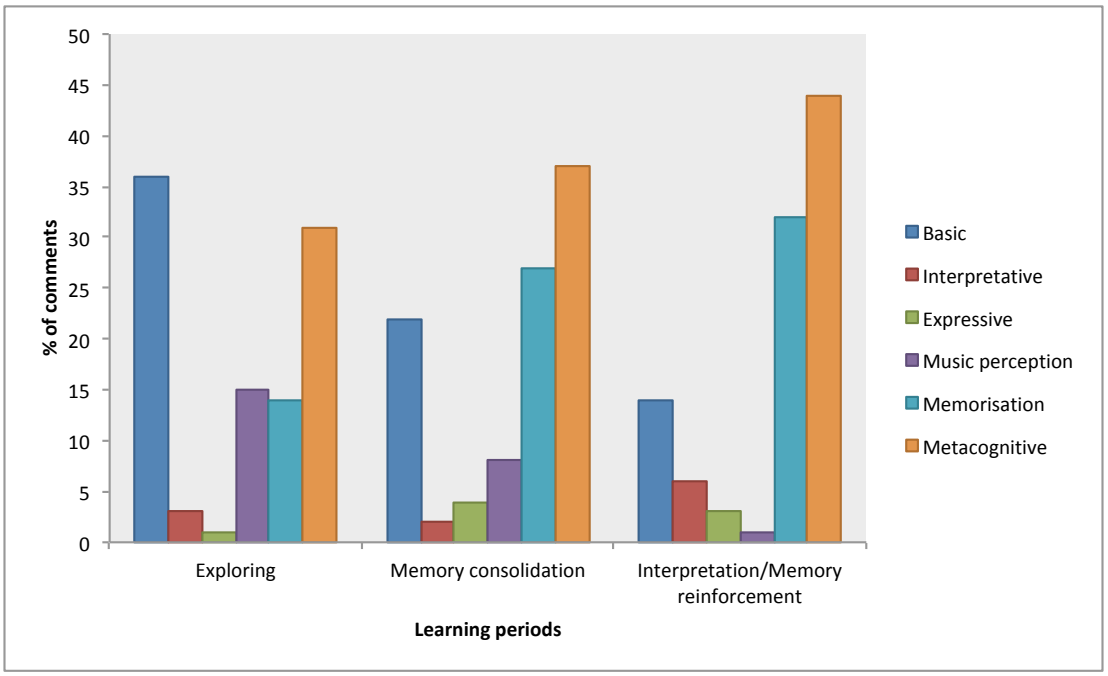
Table 26. Categories and Topics Used in Content Analysis of Sophia's Concurrent Comments During Practice

Category	Topic	Example
Basic	Notes	"I am trying to see if this is…yes…we are in treble clef, so this is C, A, F#."
	Rhythm	"I am trying to understand the rhythm."
	Fingering	"I will also change the fingering here. I will put a fourth on the A flat."
	Hand position	"Here I have to think about an open position."
	Pedal	"Ok, it says SUST. PED."
	Tempo	"The tempo is 64, so it must be…ok, it's not really quick."
	Articulation	"And is staccato too."
	Patterns	"So then we have a third minor, D minor with a minor 6^{th}."
	Melodic contour/contrapuntal motion	"I am painting like the movement of the melody."
Interpretative	Dynamics	"Ok, again and I am going to do a crescendo I think."
	Phrasing	"Here I will think about the movement, like the movement not only like happening now but the movement of the sentence. Let's say, what is the accent of the phrase and not the up and down.
	Sound quality	"We came from pp…so I am going to try to work on sound features."
Expressive	Character	"I just feel like little surprises…different kinds of surprises"
Music perception	Structure	"I don't see a really clear structure of it, I see similar rhythms."
	Associations	"I am trying to find some relation between chords, I am trying to find any relations. I am trying to understand."
	Sound perception	"Sounds a little bit creepy, it's kind of creepy."
Memorisation	Memorisation attempts	"I will try to memorise these four bars."
	Memory cues	"So what do we have here? We have almost a complete scale. This will be my cue from G to F with a B flat."
	Memory types	"Now I will try to remember from the sound memory."

	Preparing thoughts	"I am going to see which points I have to think about. So, structure, everything, so we have the first section with the closings and middle section, with this, this is important."
	Remembering	"I am starting to remember more. In bar 7 I also have to pay attention the rests, because I remember that I was a little bit confused, and now to the bar 11 and 12."
Metacognitive	Goals	"Right now, I am just trying to see how it sounds and trying to understand some things, so…I don't have a really specific goal."
	Learning progress	"I think it is starting to get a little bit more clear. I still feel it is a lot of information, so, yah, I am going to be really slow."
	Attention	"I am going to try to pay more attention to that."
	Evaluation	"Ok, the notes were good…the rhythm was awful."
	Energy levels	"I am sorry but I am going to leave it here. I am a bit tired."
	Strategies	"I am going to use colours for the bass. I am going to paint with colours. I think it will help."
	Practice structure	"Ok, I am going to do two bars, or three."
	Difficulty level	"This is really difficult"

The analysis of changes in frequency of different types of categories throughout the learning periods indicates how Sophia's decisions and focus evolved from the first reading of the score to the final performance (Figure 31).

Figure 31. Percentage of Six Categories of Comment Across the Three Learning Periods.



As expected, metacognitive remarks were quite frequent and actually increased across the learning periods. Basic issues received the highest percentage of comments during the exploration stage, but focus on this type of dimension decreased as learning progressed. Nevertheless, basic topics received a higher percentage of comments than interpretative or expressive dimensions throughout all learning periods.

Interpretative features received the highest percentages in the last learning period, when Sophia decided to set aside her attention predominantly to notes and chords and focus more on interpretative elements. Expressive dimensions were not a frequent topic of comment in the first period, but tended to increase in the later learning periods. Still, the frequency of interpretative and expressive comments was low when compared to basic dimensions.

Comments on music perception were very frequent in the first learning period, but gradually decreased as practice progressed. Sophia's main focus in the exploration phase was to decode the basic elements of the score and to perceive the sound of those elements, how they were associated and organised. The increased comfort and familiarity with the piece resulted in a decline of comments on music perception.

Memorisation was a topic of comment from the very first learning period. As reported in the first interview, Sophia usually thinks about memorisation from the

moment she approaches the piece. Because her main goal was to memorise the music, it is not surprising to see a large number of comments on this dimension throughout the learning process.

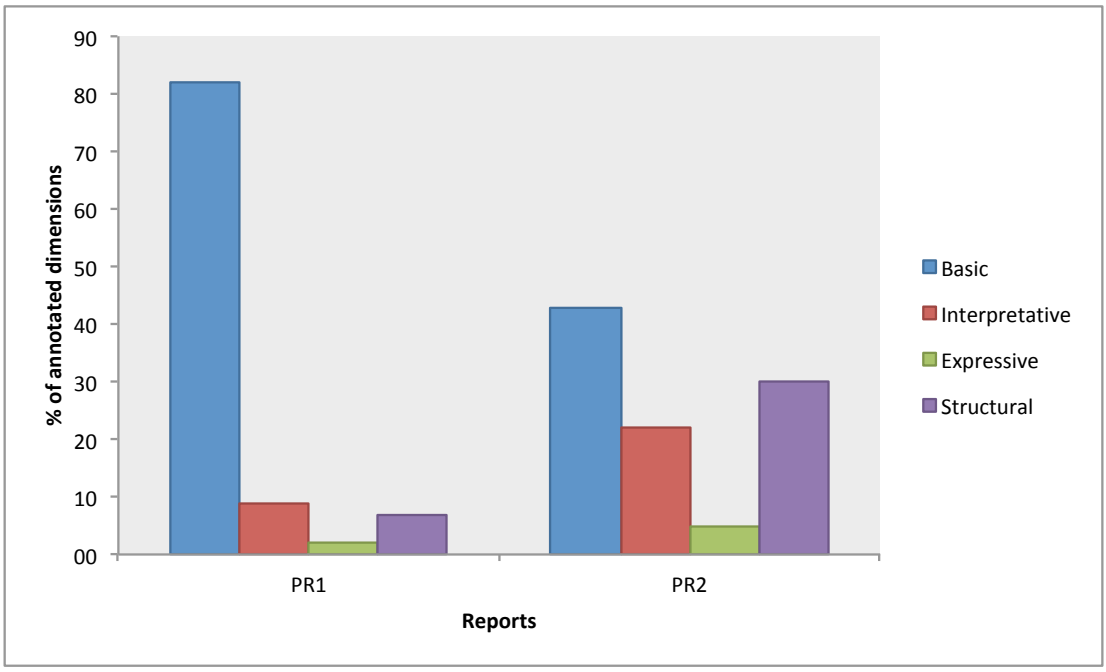
Annotations on the Scores

Sophia provided 78 annotations in two scores (score 1, *n* = 59; score 2, *n* = 19). She also marked on new scores her thoughts during performance and her understanding of structure.

The practice scores comprised basic (notes, patterns, fingerings, hand positions, technical difficulties, melodic contour), interpretative (dynamics), expressive (character) and structural (section and subsection boundaries) annotations. Some were painted red and referred to aspects of the music used as memory cues.

Figure 32 illustrates how the frequency of these dimensions evolved from one score to the other. The number of basic annotations was more frequent than any other dimension in both scores. Sophia only provided one interpretative and a few expressive annotations. Finally, structural annotations increased in the second score, suggesting that Sophia acquired a clearer idea of the piece's structural framework in the last stages of practice.

Figure 32. Percentage of Different Categories of Annotations in Two Different Scores Marked at the Beginning and the End of the Learning Process.



The different types of self-reports will now be examined in further detail, in order to obtain a clearer picture of Sophia's focus, decisions and strategies used during preparation for memorised performance.

Discussion of Self-report Analyses

Learning Stages. Sophia's concurrent comments about practice goals indicated a division of the learning process into three main periods. The first was very exploratory, beginning with an aural preview of the piece and research of historical data: *"*… since I don't know this piece, I am going to search on the internet the piece from Luciano Berio, written in 1990, so I will listen to it, to see how it sounds and if I can understand anything" (PS 1). In the same session she started reading the music in small segments. By the end of Session 12 she could play the piece from beginning to end and had already memorised some parts, but in the next session she commented: "(…) yesterday I felt that I don't remember much, like I cannot play from memory, so what I am going to do is to follow the same structure as yesterday and see if I can try to play it" (PS 13). During the following sessions she continued working on memory reinforcement. Finally, in Session 20, she reported a change of focus from basic to expressive issues*:* "Today I am going to try to do some more expressive things and stop thinking about chords and notes" (PS 20). Although interpretation issues were at the forefront of practice at this stage, Sophia was still struggling with her memory of rhythm and harmony. Therefore, she continued sorting out memory hesitations by developing more cues and establishing relationships between similar elements.

Segmentation Strategies. Sophia's concurrent and retrospective reports indicate that she focused on very small segments at first. She was aware that this would result in slow learning, but still felt this was the most effective technique: "I am going really slow, and I know, but I prefer to go slow in the beginning. I don't have any rush" (PS 1). First she started dividing the segments into paired numbers of bars (two and four), but later noticed that a division into three bars would be more effective:

> Ok, I am going to do two bars, or three, three bars…three bars why? I did four now, but one was for the atmosphere chord [first chord with sustained pedal] and the other three were chords, so now the atmosphere chord is done I see more common sense and from the structure I see not to go by four in four bars, I would rather go by

> three…Hmm, yeah, I see, by the rhythmic structure of the piece I see…I think it is more useful. (PS 1)

From this moment, whenever possible Sophia subdivided the bars into groups of three. As explained below, this division is directly related to her understanding of structure. Sophia used different criteria to structure practice. Similarly to Emma, she relied on visual layout of the score: "Ok, I did myself kind of planning, so today I am going to work in three sections, so two systems, two systems and two more systems(…)" (PS 16). Nevertheless, particularly after the second period, the majority of Sophia's remarks on segmentation relate to critical points of structure: "Let's see, so, I will try to do the four points…four starting points of each section" (PS 15).

Learning and Memorisation Strategies. During the learning process, Sophia employed a varied array of learning and memorisation strategies, combining physical and mental rehearsal. The amount of mental rehearsal was significantly less than physical practice and actually tended to decrease as practice progressed (Table 23). In the first learning period, mental practice was initially used to acquire an aural overview of the piece, through listening to existing recordings. Sophia sometimes stopped playing to analyse the rhythm and sing while marking the pulse with her hand. In Session 15 she also attempted to memorise a specific section through aural imagery.

Physical practice comprised a combination of traditional and innovative techniques. The pianist developed an exercise drawn from jazz music to develop acquaintance and understanding of unfamiliar elements:

> I will try to use some jazz exercises, for example, to understand and to familiarise [myself with them]. So, I will do these chords in different tonalities, first on root version (F, A, C, E, F#), instead of (F#, C, E, F A –written in the score, bar 2, beat 2). So, it's a really different chord, it sounds really different, but well, I think it will help. (PS 1)

It becomes clear from Sophia's comment that she attempted to find tonal and expressive meaning in atonal information. Similarly to Emma, she also worked on difficult bars by removing specific music layers: "I am not going to pay attention to the rhythm at all" (PS 10).

Sophia started deliberately memorising the piece from the very first session. This is her general approach to memorisation, as reported in her first interview (see

Table 24, p. 237). When memorisation was set as the primary goal, she alternated between looking at the score, turning it over or closing her eyes. One memorisation strategy recurrently used by this pianist was the development of different types of cues:

> So the beautiful chord [bar 36, beat 1] and now the movement [melodic contour, from bar 36, beat 2 to bar 37, beat 2] this goes together…and then the creepy chord [bar 37, beat 2], so yeah, that is the beautiful one [wrote on the score], beauty and creepy. And then I am going to keep reading a little bit, so this is in treble clef. (PS 6)

It is possible to notice in this statement that Sophia used a varied array of cues, including sound features of the chords and melodic contour. Whenever possible, she associated the new information with her knowledge of tonal music, namely harmonies, intervals or scales. When unable to relate tonal elements, she relied on other features, such as its visual display on the keyboard. Throughout the encoding process, Sophia labelled several chords based on their sound, visual or conceptual feaures, demonstrating that she was engaging in meaningful chunking of those elements.

When concrete cues couldn't be found, Sophia engaged into repetition: "I can understand but I don't find, like, any cues for now, so now I will just try to repeat until I can play without looking at the score, only listening" (PS 9). Sophia's repetitions were not meaningless, because she always engaged in goal-setting strategies to control the number and quality of repeats. Moreover, while repeating, she always attempted to coordinate finger movements with thoughts about memory cues. Sometimes she practised saying out loud what to think while playing:

> I am going to try to do it with the score and I am going to say what I am thinking at the moment, so first the movement, so [played bar 23]…and now the bass [played bar 25] and the rhythm [played bar 26]. (PS 12)

This coordination between thoughts and motor actions recurred throughout the second and third learning periods. By session 23, Sophia had clearly defined what to think about on stage:

> In this session before the concert, I am going to see which points I have to think about. So, structure, everything, so we have the first section with the closings and middle section, with this, this is important [demonstrated] and the [melodic] movement part. Yeah, and this [demonstrated] culminant points. Going to the F chord…and the difficult one…the dreamy part…the rhythm here!. (PS 23)

These comments strongly indicate that Sophia was preparing specific cues to monitor memorised performance, suggesting that she was in fact preparing a mental map to serve as safety net during memorised performance, as claimed by PC theory (Chaffin et al., 2002; Ginsborg et al., 2012).

Focus on Basic Issues. Basic issues were a frequent focus of attention throughout the learning process. During the first period, patterns such as chords were frequently commented on and annotated in the score. After playing the first chord, Sophia noticed: "First of all we have a chord [played the chord]. It seems that there is not a clear harmony in this kind of music" (PS1). The absence of clear harmony resulted in the encoding of every single chord through associations with tonal patterns, or aural and visual features (see above).The pianist also mentioned several times the direction of melodic lines between the individual chords (*melodic contour*), or in relation to each other (*contrapuntal motion*), particularly during the first two learning periods.

Rhythm was a frequent topic of comment. In the beginning, Sophia noticed that this element was not clearly written in the score and attempted to understand the rhythmic subdivision:

> I am trying to understand the rhythm, so pam, pam, pam [while marking the beat with the foot]. In the beginning it seems pretty straightforward. Ok, what do we have here… oh! the weirdest thing! Oh! [sang rhythm] I think the rhythm is one of the most difficult things here, because it is not very clearly written. (PS1)

After sorting out rhythmic problems, Sophia also used this dimension as cues to aid memorisation. Other basic elements of the score, such as markings about the pedal, tempo and articulation were mainly commented on during the first sessions, while Sophia was exploring the score content. Fingering was also a frequent topic of comment and annotation on the score in the first learning period. Decisions on this dimension were sometimes connected to other basic dimensions, such as melodic contour or articulation, with the intent of reinforcing memorisation of those passages later on:

> I will try to remember this, so the fingering will be connected to this melodic line. Yeah, the first finger on A and now I am taking the first finger and I will use 2,3 in the next one. And then until the other one I will change the 3rd to the F sharp…so I will look for connection between the G and the F sharp, so I have this. It's like you use the second finger, then you change to the third to the F# and then you change both, to do it legato. (PS 6)

Finally, hand positions were also a focus of attention, particularly in the first learning period. Similarly to the case study reported above, Sophia's comments on hand position were mainly technical, because some chord positions were very uncomfortable.

Focus on Interpretative and Expressive Dimensions. Sophia commented considerably less often on interpretative and expressive issues when compared to basic dimensions. Still, focus on these dimensions increased towards the end of the learning process. Dynamics were the interpretative dimension most frequently commented on, and the only one marked in the practice scores. Sometimes Sophia relied on dynamic progressions or phrasings to figure out musical structure:

> Now am deciding how to do the dynamics. Seeing in the final part of this section we have, like, pianissimo that goes to fortissimo […] Ok, so yes, I will try to understand, like, this is starting pianissimo and the pianissimo goes to the first fortissimo here and then it goes back to pianissimo, fortissimo, back to pianissimo, fortissimo and then coda or whatever…so, let's see what we have here. So the first fortissimo is a culminant point. (PS 4)

> Ok, I think this is the melody…is like [played the top voice of bars 38 and 39]…is like a question and answer I think ….so [played bar 38] this is more affirmative, more …is not that dissonant…so is kind of it resolves, so we have here a question…affirmative question and then the answer. (PS 6)

Moreover, she commented occasionally on sound quality, particularly in the last learning period, when her focus progressively moved away from basic dimensions.

Besides interpretative features, Sophia also thought about the feelings and emotional content expressed by this piece. Her first comment of this sort appeared in Session 2, after playing through the first part: "It just came to my mind, the expressive part of this. I just feel like little surprises, different kinds of surprises" (PS 2). As time progressed and familiarity with the basic elements of the piece increased, Sophia added emotional intent and character to her practice goals:

> Ok, once more. Now I am going to try to give some emotional sense. I am going think about the movement. I am going to try to think about the impulses and also a little bit of character depending on the sound. (PS 10)

This pianist mentioned in her first interview that an emotional connection with the piece plays an important role in her motivation for practice and memorisation. This idea is actually reflected in Sophia's comment later, in Session 10, when she noticed that she was starting to enjoy the music:

> I am starting to enjoy it, like, to give some movement and some character, and I thought about the movement inside. I know I don't remember everything, but I am starting to enjoy it, so I am going to do it once more. (PS 10)

In sum, although Sophia focused more on basic issues during the practice process, she also considered interpretative issues and expression of emotional connection as important elements in her music learning processes. This is exactly what she attempted after freeing herself more from basic difficulties.

Search for structural meaning. In the final interview, Sophia highlighted the importance of finding structural meaning in the piece (Table 14, p. 205). Therefore, it was not surprising to find a high percentage of comments on higher and lower level associations between the elements in her concurrent comments. The intention of finding connections in the music was present from the very first session: "I am trying to find some relation between chords, I am trying to find any relations. I am trying to understand, I think" (PS 1). The associations made throughout the process mainly concerned basic elements of the music, such as rhythmic patterns or chords. As mentioned before, association of new information with previous knowledge of tonal patterns was crucial for this pianist.

As time progressed, Sophia's comments evolved from specific associations to large-scale relationships. Even in the presence of an unclear structure, the pianist felt the need to find large-scale meaning and logic in the music. The structural organisation of the piece was gradual and intuitive, and evolved while exploring the music at the keyboard. While playing through the first bars, Sophia started feeling the rhythmic structure:

> I see more common sense, and from the structure, I see not to go by four in four bars, I would rather go by three…Hmm, yeah, I see, by the rhythmic structure of the piece I see…I think it is more useful. (PS 1)

The division of the piece into three-bar subsections was an important premise of Sophia's structural division, particularly on the first page. The pianist was aware that this ternary division was personal and not at all related to the composer's structural intention:

> I am going to divide it in another three bars, because I see I can divide it like three more and three more, even though it's not like the composer's idea, but it's useful for me. So I am going to keep going this way, so three bars, three bars and then 1, 2, 3 bars. (PS 3)

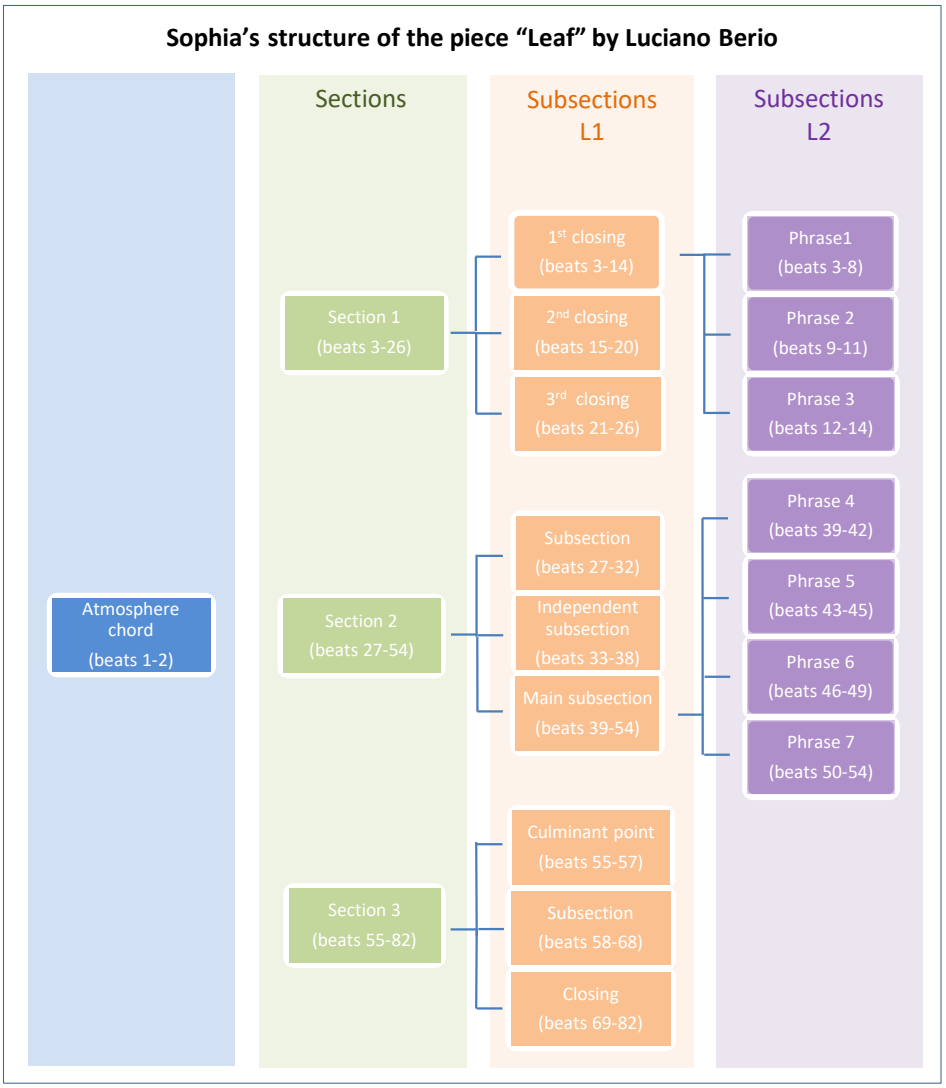
Sophia also used her knowledge of tonal grammatical rules to find closing points in the musical structure. When playing bar 7 for the first time, she noticed: "Ah! It seems like a cadence. It's a little weird here, the cadence, but I know this is not like this, but I will use it as a cue, even if it is not the same in contemporary music…" (PS 1).

As time progressed, she started integrating the three-bar subsections into larger sections. The division into groups of three also applied to the higher levels of the structure. This type of structural division is very common in tonal repertoire (ex: A–B–coda). This suggests that the pianist was probably relying on her knowledge of structural forms to find a structural plan for this piece. The three-part division unfortunately did not work out on the second page:

> Ok, that's weird. Let's see. I am going to play to see if I can find something. I am a little bit confused now [played]. It's like here there is a lot less silence, it's not like little sections inside, it's more of a big one (…). (PS 4)

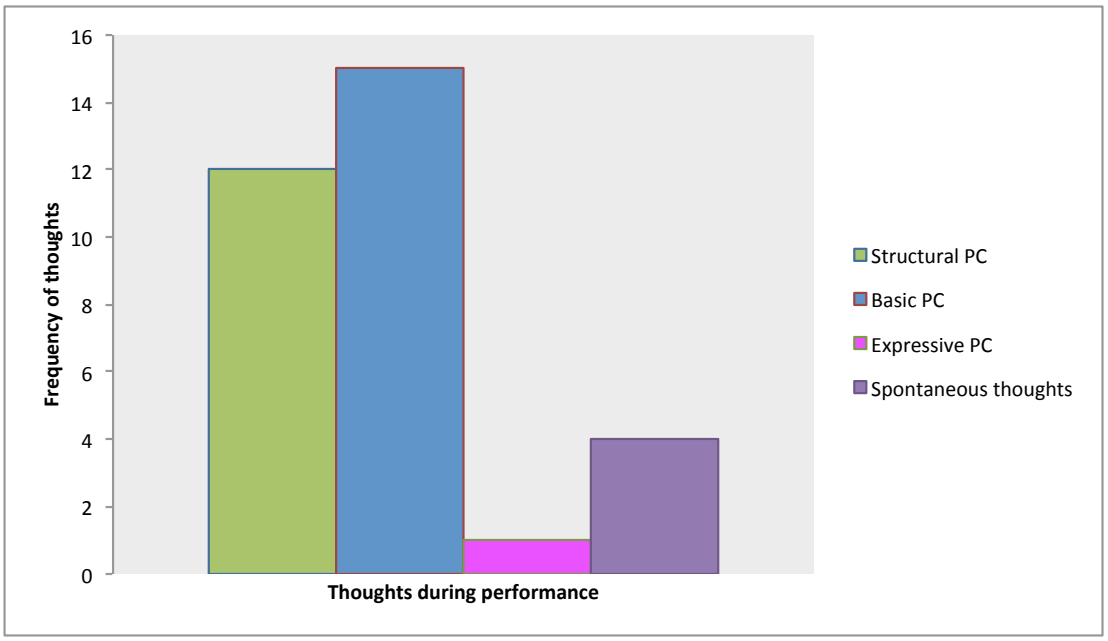
Because the structural meaning was even more difficult to understand on his second page, Sophia relied on elements such as dynamics and rhythms to find structural meaning. During the second learning period she was able to find a structural organisation for the piece, which was later reported after the memorised performance (Figure 33).

Figure 33. Structure of the Piece Leaf by Luciano Berio, as Perceived by Sophia.



Thoughts During Performance. Sophia's retrospective reports of the performance indicate a combination of spontaneous and prepared thoughts. After the memorised performance she annotated her thoughts on a new score. Figure 34 represents the frequency of different types of thoughts during memorised performance. In total, Sophia reported 28 prepared thoughts (PCs) and 4 spontaneous thoughts. The majority of PCs were basic (15) and structural (12), with only one expressive PC.

Figure 34. Frequency of Structural, Basic, Expressive and Spontaneous Thoughts During Memorised Performance.



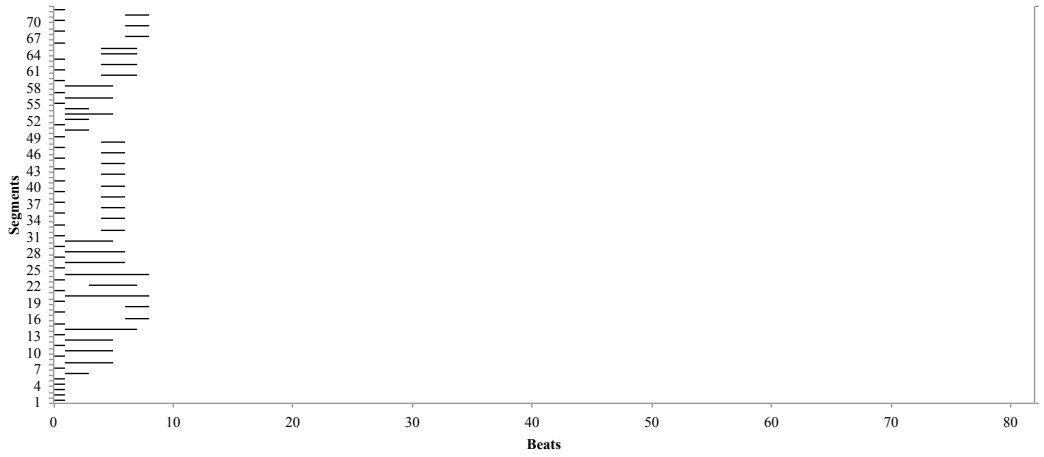
Structural PCs matched Sophia's structural division, reported above. Basic PCs included dimensions that the pianist paid attention to during the learning process, such as patterns (mainly chords), melodic contour, rhythm, notes and hand positions. The only expressive PC reported was a feeling of tension in bar 5. Sophia also reported spontaneous thoughts, including a sound perception of the resulting sound, one doubt that she had in bar 52 (even though she played it correctly) and a feeling of relaxation in the last four bars.

5.3.2.2 Analyses of Practice Behaviour

Sophia's video recordings were divided into three sets, according to her description of learning stages: (1) *Exploring* – Sessions 1 to 12; (2) *Consolidating memory* – Sessions 13 to 19 and (3) *Interpretative* – Session 20 to 25.

Learning Period 1. As reported by the pianist, practice at this stage focused on very small elements (Figure 35).

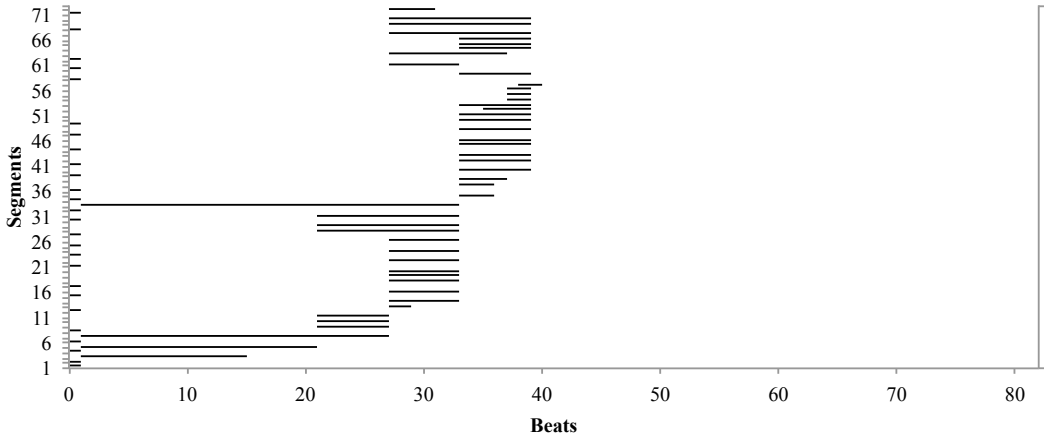
Figure 35. Practice Graph from Session 1.



The only time Sophia played the piece from beginning to end in this first period was at the very end of the last session (Session 12). According to her self-reports, she was mainly focused on decoding the detailed elements of the music. During this first period, 25.4% of practice segments were performed by heart, while 74.6% were played while looking at the score. Sophia practised mainly with hands together (79.9 %). When practising with hands separate, 12.7% of practice segments targeted the left hand and 7.3% the right hand.

Learning Period 2. During this period Sophia started integrating smaller segments into larger sections. Figure 36 illustrates how practice was structured at this stage.

Figure 36. Practice Graph from Session 16

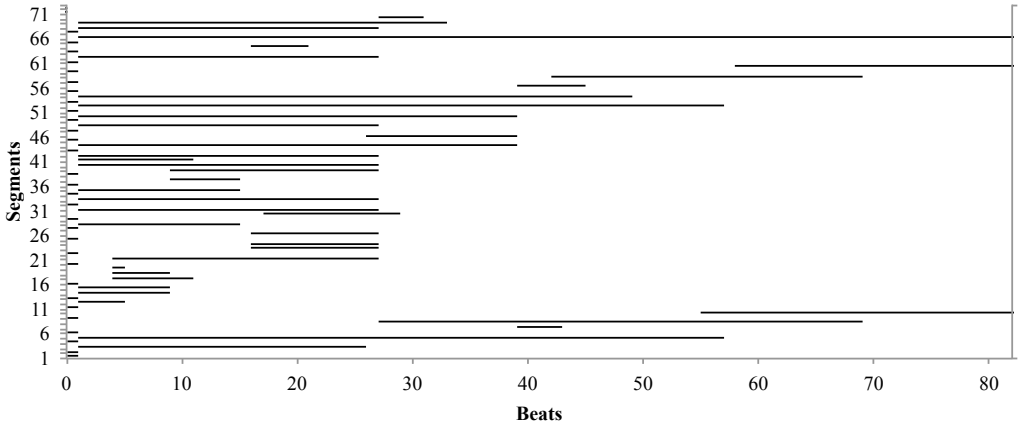


The majority of played attempts were once again performed with hands together (85.1%), with only 8.4% of practice segments played with the left hand and 6.5% with the right hand.

During this period, Sophia also started running through the piece at the end of the sessions. The first time she attempted to play the piece by heart from beginning to end was in Session 14, although with several hesitations and memory slips. By the end of Session 19, she played from memory with more confidence, although she kept confusing the last bars. At this point, it was possible to notice that the pianist was still feeling overwhelmed with the large amount of information in the piece, but was gradually increasing confidence.

Learning Period 3. Practice structure at this point focused more on larger segments and on the integration of different sections (see Figure 37). Most practice segments were performed by heart (92.8%) and with both hands (88%).

Figure 37. Practice Graph from Session 23.



Relationship Between Sophia's Reports and Practice Behaviour. Multiple regression analyses examined the relationship between 11 dimensions drawn from Sophia's self-reports, the predictors, and the frequency of starts and stops in practice for each learning period or outcomes. The selected dimensions included Sophia's understanding of structure, visual layout of the score, difficult passages and cues used to monitor memorised performance.[37] The models using frequency of repetitions as the dependent variable are not reported in this thesis, as they were not statistically significant. Tables 27, 28 and 29 present the regression coefficients (unadjusted) of Sophia's reported musical dimensions on the number of starts and stops in each practice set. The models with starts as outcome variables predict between 50% and 62% of the variance. One of the models with stops as the dependent variable was not significant, but the other two were able to predict between 38% and 46% of variance. The models using frequency of repetitions as the dependent variable were not statistically significant. Although Sophia started and stopped more at some places, she did not repeat those locations more reliably than others. The R^2 values are actually higher than the ones reported in previous studies, probably because the piece was shorter and there was less variation in the type of dimensions involved. Out of the 66 potential effects of predictor variables, nine were significant at the $p<.001$

[37] Most predictors presented non-significant correlations *(r* < .20). System beginnings and major section beginnings presented a moderate positive correlation (*r* = .31). Similarly to Emma, the reported structural PCs were not separated from musical structure in this model, because the significant agreement between both dimensions could affect the results of the regression model.

level, one at the p<.01 level and five at the p<.05 level. The significant effects were all positive, indicating that starts and stops recurred in locations where those dimensions were present.

Table 27. Regression Coefficients (Unadjusted) for the Effects of Structural Boundaries, Score Layout and Difficult Passages on the Number of Starts in Each Practice Session Set, with R^2.

Starts

Learning Phase	1. Exploring	2. Consolidating Memory	3. Interpretative
Session Set	1–12	13–19	20–25
Structural boundaries			
Sections – Beginnings	23.37*	4.72	16.98***
Sections – Ends	3.96	-8.85	-0.15
Subsections – Beginnings	25.03***	22.30***	7.81***
Subsections – Ends	-4.81	-0.97	-1.25
Score layout			
Pages – Beginnings	44.03***	2.90	24.30***
Pages – Ends	-8.94	17.48	-0.22
Systems – Beginnings	22.85*	15.77*	9.40*
Systems – Ends	-11.83	1.73	-0.72
Difficult passages			
Difficult passages	7.18	0.17	13.63***
PC Basic	5.97	-2.05	-3.18
PC Expressive	-5.07	-7.72	-0.25
R^2	**0.53*****	**0.50*****	**0.62*****
***** p<.001, ** p <.01 * p<.05**			

Table 28. Regression Coefficients (Unadjusted) for the Effects of Structural Boundaries, Score Layout and Difficult Passages on the Number of Stops in Each Practice Session Set, with R^2.

Stops

Learning Phase	1. Explore	2. Consolidating Memory	3. Interpretative
Session Set	1–12	13–19	20–25
Structural boundaries			
Sections – Beginnings	-8.60	4.31	2.01
Sections – Ends	11.50	10.49	14.66**
Subsections – Beginnings	-5.65	3.16	1.92
Subsections – Ends	27.07***	13.29	6.14*
Score layout			

Pages – Beginnings	-0.80	6.14	-1.60
Pages – Ends	-1.38	16.47	9.03
Systems – Beginnings	-3.07	-11.01	-8.00
Systems – Ends	11.50	-12.29	0.58
Difficult passages			
Difficult passages	7.08	14.19	17.66***
PC Basic	-5.49	-4.40	-2.75
PC Expressive	6.58	0.63	7.15
R^2	**0.38*** **	**0.23**	**0.46*** **
**** p<.001, ** p <.01, * p<.05**			

Table 29. Regression Coefficients (Unadjusted) for the Effects of Structural Boundaries, Score Layout and Difficult Passages on the Number of Repeats in Each Practice Session Set, with R^2.

Repeats

Learning phase	1. Reading	2. Deliberate Memorisation	3. Interpretative
Session set	1-12	13-19	20-25
Structural boundaries			
Sections_Beginnings	13.11	-4.19	11.56
Sections_Ends	-3.57	-25.95	-9.73
Subsections_Beginnings	2.66	13.76	4.42
Subsections_Ends	13.79	2.84	3.93
Score Layout			
Pages- Beginnings	5.77	20.78	2.66
Pages- Ends	-40.11	50.14	-1.77
Systems-Beginnings	38.85	-1,15	-2.62
Systems- Ends	-8.86	3.71	-2.95
Difficult passages			
Difficult passages	-3.01	5.86	15.98
PC Basic	-0.01	-1.41	-1.10
PC Expressive	-2.41	-20.29	3.31
R^2	**0.08**	**0.13**	**0.24***
**** p<.001, ** p <.01 * p<.05**			

Table 30 summarises the significant effects on starts (B) and stops (E) of the selected dimensions.

Table 30. Summary of Significant Effects (p<.01*) of Structural Boundaries, Page Layout and Difficult Passages on the Frequency of Starts (B) and Stops (E), with Effects on Starts Highlighted and Effects on All Two Measures at the Same Time in Bold Italics.

Learning Phase	1. Exploring	2. Consolidating Memory	3. Interpretative
Session Set	1–12	13–19	20–25
Structural boundaries			
Section – Beginnings	s		S
Section – Ends			E
Subsection – Beginnings	S	S	S
Subsection – Ends	E		e
Score layout			
Pages – Beginnings	S		S
Pages – Ends			
Systems – Beginnings	s	s	s
Systems – Ends			
Difficult passages			
Difficult passages			***SE***
Performance cues			
PC Basic			
PC Expressive			

**Effects on starts, stops and repeats that were significant at the p < .01 are shown in capital letters while effects at the p <.05 levels are represented by lower cases b, e and r.*

As suggested in Sophia's self-reports, she consistently used structural boundaries as starting and stopping places throughout all learning periods. In fact, structure was the dimension receiving the highest number of effects in the first and last learning periods.

Subsection boundaries were used recurrently as starting and stopping places while first exploring the piece. This result provides evidence that Sophia attempted to grasp the structural meaning of the music from the early stages of learning, and used it to organise practice. The exploratory approach based on a three-bar division mentioned in Sophia's comments during this period is directly related to her reported subsections. The multiple regression analyses provide further evidence that these locations were indeed consistently used as starting and stopping places during practice.

The pianist also started practising repeatedly from visual boundaries of the score. This result corroborates Sophia's concurrent comments, as she reported using these two types of structural organisation to segment the piece for practice.

In the second learning period, Sophia continued using subsection boundaries as starting locations, but not as much as stopping places. During this period the reported dimensions were not able to significantly predict Sophia's stopping locations. In the final learning period, Sophia used all levels of structural understanding to organise practice. Practice started and stopped at major sections and subsection boundaries more than other locations. Once again, the analysis of practice behaviour confirms Sophia's reports that in the last period she started integrating the subsections into wider sections. The multiple regression analysis clearly shows the use of structural understanding at low and higher levels in this last stage of practice.

These results provide robust evidence that Sophia's understanding of structure was used as a basis for a hierarchical retrieval structure used to encode the music. The pianist's reports after the memorised performance also suggest that this scheme was used during retrieval. Basic and expressive PCs did not affect Sophia's starts and stops during practice. These PCs were usually located in the middle of major sections and subsections. It appears that even though Sophia reported thinking about them to monitor memorised performance, she used more critical points in the music structure and visual layout of the score to structure her practice of the piece.

The multiple regression analyses provided information that was not reported by Sophia during practice. Despite not commenting about this in the last learning period, she started and stopped more consistently in technically difficult bars (ex: bar 35) than other locations in the final learning period. The simultaneous effects of starts and stops in this dimension indicate that the pianist was singling out this problem for practice before the performance. One possible explanation is that Sophia wanted to be as accurate as possible so close to performance, thus targeting more technically demanding passages. She did not report thinking about these difficult places in performance. Therefore, the elevated number of starts and stops appears to indicate more technical work than preparation of thoughts for performance.

5.3.2.3 Summary

Sophia memorised Berio's *Leaf* in a period of three months. After 25 practice sessions, she was able to perform the piece with 99.39% accuracy. She had never performed non-tonal music by heart before this study because she found it difficult to memorise. However, like Emma, she memorised Berio's *Leaf* with success.

The pianist started learning with an aural and notational overview of the piece (Mishra, 2005). She then explored it on the keyboard for 12 sessions, while simultaneously reading and memorising. After Session 13 she continued consolidating memory, and after Session 20 her focus changed to more interpretative and expressive dimensions.

Sophia used a segmented approach throughout all learning periods, beginning with very small segments, interspersed progressively with larger segments. She reported relying on score layout and on her own structural understanding of the piece to segment practice. Similarly to Emma, Sophia followed an idiosyncratic approach to develop understanding of musical structure, based on rhythmic structure and feelings of closure, as well as associations with tonal cadences. The multiple regression analyses indicated that she started and stopped more at score layout and structural locations throughout all learning periods. The pianist explained in the final interview how she prepared these structural boundaries to serve as recovery points in case of memory failure. The triangulation of her self-reports with practice behaviour strongly suggests the use of a hierarchical retrieval scheme during encoding and retrieval, with personal structural understanding at the highest organisational level. Sophia also reported relying on basic and expressive PCs in performance, but they were not used to organise practice, probably because of their location in the middle of critical structural points. The analyses of practice behaviour also indicated that Sophia singled out difficult bars for practice in the last learning period.

Sophia relied mainly on physical practice, but also used occasionally mental rehearsal, namely structural and rhythmic analysis and aural imagery. The development of memory cues was crucial during the deliberate memorisation stages. Several cues were associated with tonal patterns. This type of association with previous knowledge was very important to this pianist, not only while memorising, but also throughout the first stages of encoding. When association to tonal patterns was not effective, Sophia relied on other sound or visual features, such as the

resulting hand-shape. During practice, she always attempted to coordinate thoughts about these cues with motor actions, verbalising these cues while playing. Moreover, she carefully prepared thoughts for memorised performance, strongly suggesting that she was developing PCs (Chaffin & Imreh, 2002). Sophia focused more on basic issues during practice, but in the last period shifted focus to more interpretative and expressive dimensions. In the first interview she mentioned that an emotional connection is an important element of her engagement with a musical piece. These results will be further discussed in Chapter 6.

5.3.3 Case Study 3: Harry

Harry started learning Berio's *Leaf* in February 2018. He struggled to cope with other performance commitments and considered dropping out of the research study. The only solution was to delay practice until the summer. He resumed study in July and worked on *Leaf* for a period of three weeks. During this period he engaged in 5.34 hours of physical practice and a few seconds of mental rehearsal (Table 31).

Table 31. Timetable with Distribution of Practice Sessions and Final Performance, Organised into Three Stages of Learning, with Information About Date, Duration of Physical (PR) and Mental Rehearsal (MR) and reports of Musical Decisions, Structure and PCs.

Learning Stages	Session	Date	PP Duration	MR Duration	Annotated Score
Reading/Exploring	1	20/02/18	29.43	N/A	1
	Break				
	2	02/07/18	35	N/A	
	3	05/07/18	32.05	0.18	
	4	10/07/18	22.19	N/A	
Deliberate memorisation	5	12/07/18	32.23	N/A	
	6	13/07/18	33.33	0.25	
	7	14/07/18	33.32	N/A	
	8	16/07/18	17.38	N/A	
Memory consolidation	9	17/07/18	22.18	N/A	2
	10	18/07/18	21.19	N/A	
	11	19/07/18	10.41	N/A	
	12	20/07/18	9.10	N/A	
	13	21/07/18	22.57	N/A	

Although Harry had more time in July, he was still very busy with other commitments. He decided to perform the piece from memory, even though he was still not secure. During performance, Harry had several memory problems, only performing 50% of the music accurately.

5.3.3.1 Analyses of Self-reports

Retrospective Reports

Harry's first semi-structured interview lasted 20 minutes. The four common superordinated themes and respective sub-themes emerging from the IPA analysis are presented in Table 32.

Table 32. IPA Table from Harry's First Interview.

Superordinate Theme (Su.T)	Sub-theme (ST)	Examples
Musical training	Previous studies	"I started playing piano very young, about age five or six and only did really casual lessons and just followed the standard route of learning (H, p. 497, lines 4964-4965)".
	Repertoire	"I am doing a lot of American experimental repertoire at the moment. So pieces by Crumb, Nancarrow, the Concord Sonata, that's the kind of music I really enjoy" (H, p. 497, lines 4974-4975).
Performing contemporary music	Attitudes towards contemporary music	"At Trinity I really developed a love for modern music, twentieth century and contemporary" (H, p. 497, lines 4968-4969).
	The performer of contemporary music: • Conviction • Enjoyment • Rhythm	"Conviction. Confidence I guess, and just engagement. I think you just have to like it. I hear so many performances of little compulsory short pieces standard pianists [have been playing] and they don't enjoy it and it's evident. I think a good sense of rhythm is important

		and being able to do cross rhythms and keep the pulses. But other than that, really, just enjoy it" (H, p. 499, lines 5072-5076).
	Collaborations with living composers	"I am actually [collaborating], at the moment. Not a non-tonal composer. I don't think so. But she is a student here and she is really good. She does a lot of kind of minimalist music" (H, p. 499, lines 5080-5081).
The choice of playing from memory	The repertoire factor	"I don't play accompaniment or duo music. I think every [solo] concert I have done so far has been from memory" (H, p. 497, lines 4998-4999).
	Benefits • Practical issues • Freedom • Security	"Mainly to avoid page turns [laugh]. Lots of the music I play, as you know, there are lots of notes and both hands are being used all the time, so, more for convenience than any kind of "connection". Practicality" (H, p. 498, lines 5003-5005). "[…] but also it does help for it to flow freely to use a cliché, and it means you're more secure" (H., p. 498, lines 5010-5012).
Learning and memorisation approaches	Unsystematic approach	"So I have zero method. I will just start at the beginning and play it until it goes. I don't have any techniques, I don't have any specific markings. I'm trying to incorporate a few, but mainly no. I think it's mainly aural and physical memory" (H, p. 498, lines 5021-5023).
	Incidental vs deliberate memorisation	"I can't explain. It just happens" (H, p. 498, lines 5023-5024).
	Memory types • Aural memory • Kinaesthetic memory	"I think it's mainly aural and physical memory" (H, p. 498, line 5023). "I think I have quite a good aural memory, so I find when I've been practising a piece for about half an hour, I think I can do about a minute of what I've been playing from memory, just like that. That's just a guess" (H, p. 499, lines 5046, 5048).

During this first interview, Harry mentioned he had recently gained interest in contemporary repertoire and decided to pursue a Masters in Contemporary Specialism. Harry described his most recent experiences of performing this repertoire, including collaborations with living composers. He considers that pianists need conviction, engagement and rhythmic skills to perform this type of music.

This pianist performs all repertoire by heart, except chamber music, mainly because of the practical benefits of not having to turn pages, improved freedom and security. Harry does not follow a systematic approach to learning and memorisation, reporting that he has "zero method" and mainly relies on incidental memory. Harry's last interview lasted 25 minutes. The themes emerging from the IPA analysis are presented in Table 33.

Table 33. IPA Table from Harry's Final Interview.

Superordinated Theme (Su.T)	Sub-Theme (ST)	Example
Thoughts during performance	Spontaneous thoughts	"[I was thinking] don't mess up, don't mess up [laugh]" (H, p. 501, line 5128).
	Memory slips	"I guess you could say, the beginning of the third line I was trying very hard not to forget that one, but I did (H, p. 501, lines 5128-5129)".
	Lack of prepared thoughts	"Well, what I think I would have needed to do is, you know, have more points in which I could restart" (H, p. 501, lines 5132-5133).
Experiences throughout the study	Challenges faced with Berio's Leaf • Difficult to develop aural memory • Difficulty in finding structure	"But again, the music that I play is usually easier, because I can listen to myself playing. I know where it is going and I can hear it in my head, as opposed to this, which is not meant to be. Well, I don't think it is meant to be memorable, it's more like that it sticks" (H, p. 503, lines 5237-5240). "Most of the music that I play isn't like this [Berio's *Leaf*], it's more kind of involved, if you know what I mean. This is a bit events' based. Most of the music that I play is more kind of narrative, so it's not necessarily, it's a bit more obvious, if you

		know what I mean" (p. 502, lines 5173-5174).
	Influence of research task	"[…] I was specifically learning this to be memorised, which is not what I usually do. My approach was different and also I was recording myself, aware of everything I do, which is good but inevitably different. I feel like I maybe tried too much to learn the notes and therefore I was too focused on rhythm and perfectionism (p. 502, lines 5199-5202)."
Learning and memorisation approaches	Segmentation strategies	"I tried to do it first in two bars phrases, then in four bars phrases. Well, my aim was to get it probably in eight bar phrases, which I don't think I did have much time to do" (H, p. 501, lines 5157-5159).
	Search for structural meaning	"I guess I don't have a structure because I don't have an organisation only and I think this happens in this piece, because this is, minus the exchanges, just notes, there is not much deviation in say registeres. So, you've got really to just know the notes, which is something I don't know very well [laugh]" (H, p. 502, lines 5180-5183).
	Score markings	"In the beginning I wrote a lot on my score, but that is what I usually do" (H, p. 502, lines 5206-5207).
	Incidental vs deliberate memorisation	"In certain practice sessions I set myself some [memory] goals. The first two lines, the last two lines" (H, p. 503, lines 5224-5225).
	Memorisation cues	"[…] I was trying to follow some kind of chromatic movements" (p. 501, lines 5167).

Harry reported mainly spontaneous thoughts during memorised performance, related to his fear of memory failure in the third system of the score. Actually, this was the place where he had the first memory slip, which completely disrupted the performance. The pianist recognised that preparing safety points to recover from

memory slips would have made the difference (Table 33). Harry mentioned that *Leaf* was particularly hard to memorise due to difficulties in developing aural memory. This was an unexpected development, because he was actually very confident about this type of memory in the first interview. He also mentioned several times how the research task affected his process, because it made him very aware of everything he was doing. For example, he actually engaged in deliberate memorisation, even though he had reported in the first interview about only relying on incidental memorisation. Harry justified this by explaining that he was too focused on the research goal of memorising. Still, he did not report using many strategies, just some score markings and a few cues to aid memorisation.

Concurrent Comments

Harry provided a total of 394 comments to the camera. In total, 19 comment topics emerged from the content analysis and were categorised into five categories (Table 34).

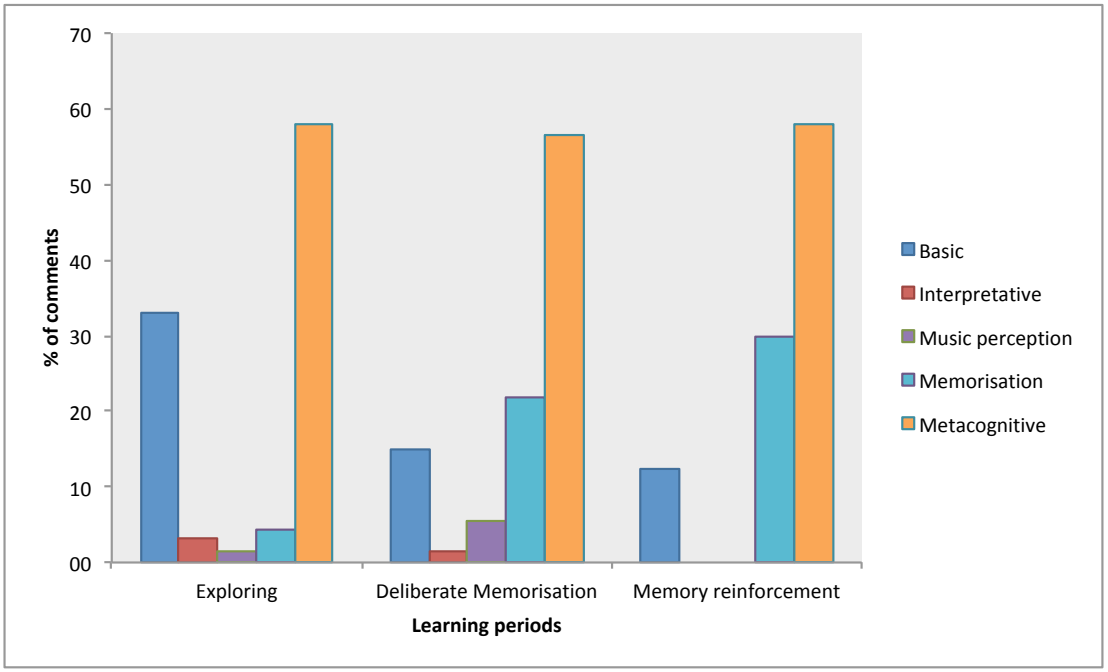
Table 34. Categories and Topics Used in Content Analysis of Harry's Concurrent Comments During Practice.

Category	Topic	Example
Basic	Notes	"The second is F sharp actually."
	Rhythm	"The first bar of the third line, that is quaver rest and here also a quaver."
	Fingering	"It's 5 and I know that I am jumping from [B flat] to [E flat] to that fingering, because I am expected to be down here."
	Hand position	"Making sure I get the hand position."
	Pedal	"Ah, I have the wrong pedal, ok."
Interpretation	Dynamics	"I will try to add dynamics as well, some musical stuff."
	Sound perception	"So I will do a bit of work on the kind of sound."
Music perception	Associations	"And that is the same note for the last chord, so I am going to put these lines which I use to tell me is the same note."
	Structure	"Everything seems to lead into the next bit…there is no kind of proper end of phrases."
	Sound perception	"Oh, that's a nice chord."

Memorisation	Memory cues	"So I've got to really listen for that chromatic [line]"
	Remembering	"Oh…I can't remember the first note …Oh."
Metacognitive	Goals	"I am going to set myself a goal …to learn those notes, because I haven't marked yet anything from the last time and it looks like they are the most complex, so that's my goal.
	Segmentation	"Last line of the second page now."
	Strategies	"This is a notation I've just come up with quite recently, I am just drawing boxes around these notes to remind me of position…it helps me."
	Attention	"I zoned out a bit in the middle."
	Evaluation	"Ok, that was pretty good."
	Fatigue	"Sorry, I am quite tired today."
	Learning progress	"The feeling is setting in, so, I guess I've done something."

Figure 38 presents the frequency of different categories of topic for each learning period.

Figure 38. Percentage of Five Categories of Comment Across the Three Learning Periods.



The most frequent category of comment was metacognitive. Although Harry stated in his first interview that he did not follow a systematic approach to practice, the nature of this research study actually influenced him to make several metacognitive reflections, as he was asked to comment on every decision or thought process during the process.

Comments on memorisation were present from the first learning period, but increased, particularly in the last two stages. Once again, although Harry mentioned in the first interview not thinking too much about how to memorise, in this study the main goal was to commit the piece to memory, explaining the increased focus on this dimension as practice progressed.

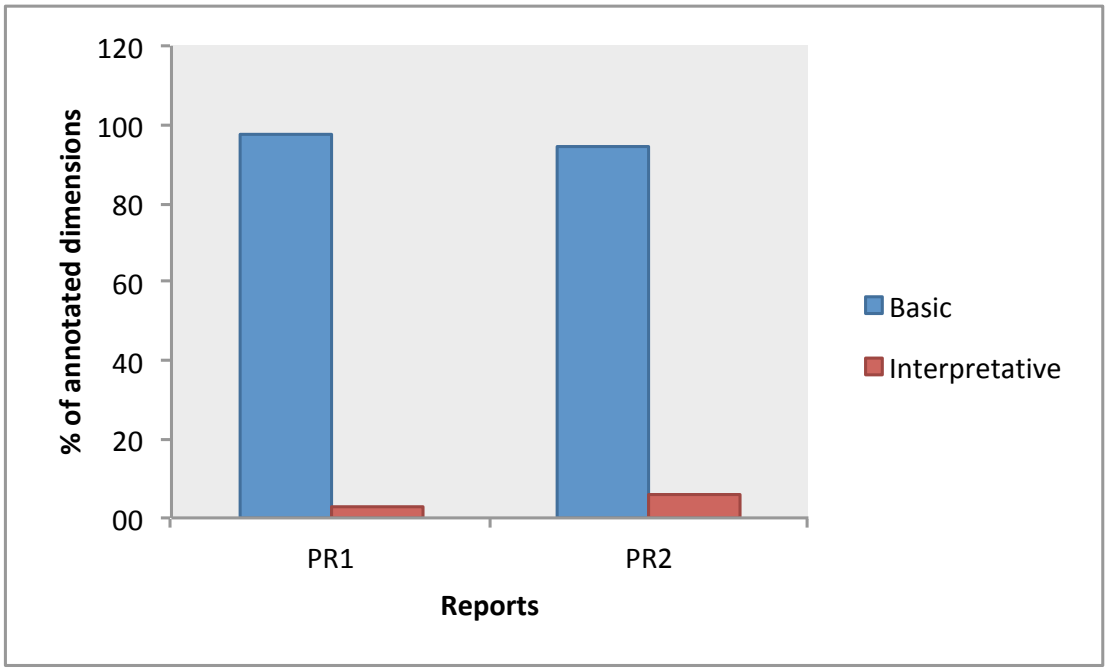
Basic dimensions were the third most frequent topic of comment in all learning periods. Focus on these issues was higher in the first period and tended to decrease as practice progressed. Nevertheless, similarly to the case studies discussed above, this dimension was much more commented on than interpretative issues. Harry made only a few comments on interpretation during the first and second learning period, but stopped commenting on this dimension near the performance. The analysis of comments reveals that he knew the concert was approaching and his main concern was to memorise as much as he could in time for the performance.

Harry also did not comment much on music perception during practice. He made a few comments about sound perception and associations between the elements, but only mentioned a few times the structure of the piece in the second learning period. He actually felt the absence of closing points in the structure, as every note was leading to the next until the fortissimos on the next page. Therefore, he focused more on knowing the notes than properly finding a structural meaning in the music.

Annotations on the Scores

Harry provided 55 annotations (37 – first score; 18 – second score) in two practice scores. His annotations mainly concerned rhythmic subdivision, chord labels, specific notes, accidentals (flats or sharps), fingerings and hand positions. He also made one annotation about dynamics. Figure 39 illustrates the percentage of basic and interpretative categories of annotated dimensions in both scores.

Figure 39. Percentage of Different Categories of Annotations Marked in Two Different Scores Marked at the Beginning and End of the Learning Process.



The percentage of basic issues remained almost the same from one score to the other and was considerably higher than interpretative annotations, suggesting that his decisions in practice focused mainly on basic dimensions. Harry didn't mark anything about structure or expressivity throughout the learning process.

Summary of Self-report Analyses

Although Harry described himself in the first interview as a natural learner and not using a systematic approach to practice and memorisation, he did make an elevated number of metacognitive remarks about his goals, practice structure, strategies used, evaluation and monitoring of the process.

Learning Stages. The analysis of concurrent comments on practice goals suggests a division of practice into three main periods. Unlike Emma and Sophia, Harry didn't start with a preview of the piece, but started straight away exploring the piece and exploring rhythmic figurations and fingerings: "I am just going to start straight from the beginning and see what I find" (PS 1). After the first session, Harry was not able to practice Berio's *Leaf* for almost four months. He then spent three more sessions

exploring the piece; in Session 5 he mentioned: "I am going to try and start really memorising it now" (PS 5). By the end of Session 8 he had made several memorised attempts on the whole piece. After Session 9 he decided to continue practising and just trying to consolidate memory as much as possible until the final performance.

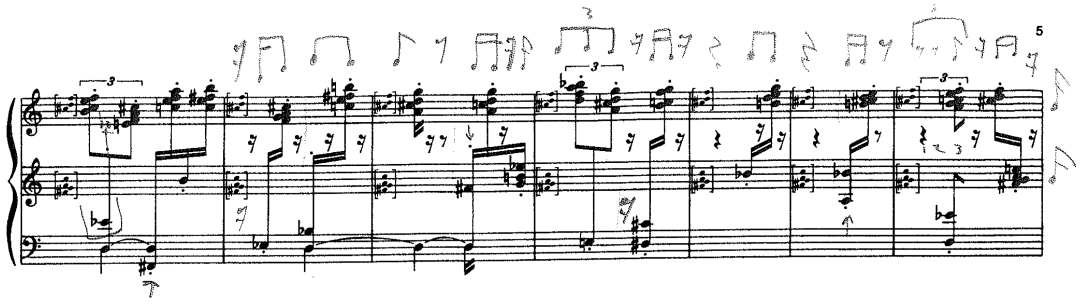
Segmentation Strategies. Harry interspersed the practice of small and larger segments, as well as run-throughs of the piece. For the most part he didn't explain his criteria for selecting segments, although sometimes he reported relying on visual layout of the score. His concurrent reports suggest a tendency to start frequently from the top, as he kept mentioning coming back to the beginning. Harry actually noticed this tendency in Session 5: "At the moment I am just starting from the beginning all the time" (PS 5). When memorisation became the main goal in practice, Harry worked on small segments of the piece. He noticed that, for this particular piece, the best approach would be to memorise small amounts of information at a time, although he was not following a systematic approach when selecting the segments:

> Ok, it looks like I've just going to have to …the way I've been doing this …the most effective way of doing this is just a bit at a time memorising, so yeah, I will try and do that. (PS 7)

> I will just allow to play random bits over and over until it sticks really, that is really not much to comment on that. (PS 8)

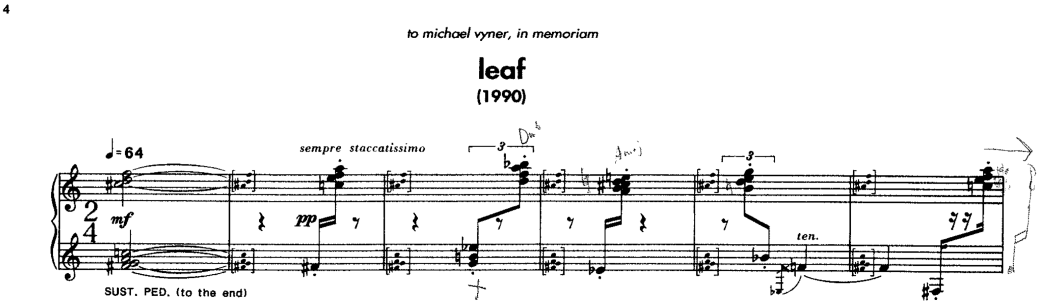
Physical and Mental Strategies. While exploring the music, Harry did not use a vast array of strategies, relying heavily on repetition. In the final interview he mentioned using metronome sometimes to have a better feeling of the downbeat. He also reported making several markings on the score in the first learning period. His first score has some drawings of simpler versions of rhythms or symbols reminding him of specific hand positions (Figure 40).

Figure 40. Harry's Marked Simplifications of Rhythmic Figurations in the First Score.



Although Harry did not specify how he was encoding the chords in this music, he wrote associations with tonal chords on the first score (Figure 41).

Figure 41. Harry's Annotations of Tonal Patterns on the Score of Specific Chords in *Leaf*.



Maybe he didn't comment on this association because it seemed too obvious or he was too focused on the process and forgot to comment, but he did label some of the chords according to his knowledge of tonal patterns. As stated above, Sophia also used this strategy to meaningfully encode this musical element.

After Session 5, Harry's focus turned to memorisation, and his goals were directed to this process. The main memorisation strategy used was repetition, while progressively moving his visual focus away from the score: "So, I am going to play it a few times and I am going to gradually look less and less at the copy. Hopefully it will sink in" (PS 3). The pianist was hoping that memorisation would just come naturally through repetition. Unfortunately, it didn't develop as spontaneously as hoped, at least in such a short time. Therefore, Harry attempted other strategies, such as mental imagery (e.g., reading the score mentally while imagining the music aurally and physically). He intended to engage in more score reading, but didn't find time to do so. He also listened to some existing recordings, but not as much as planned, again

because of time constraints. Another strategy consisted of playing at different speeds. Sometimes Harry practised faster, in order to attempt to focus more on hand gestures, as opposed to single elements:

> Ok, just had a thought, maybe I am going to try and practise it really fast, well faster than needed to see if I get…because this is all about knowing where to go the hands so maybe practising it fast will mean I can think in longer phrases. Let's do that again. (PS 9)

Later on, he also considered using slow practice, but ended up giving up the idea because he thought it would not be helpful to the memorisation process: "Maybe I will try once really slow…I haven't done it before, but, yah, why not? It might be helpful [played slowly]. No, this is more about technique, I am not going to use it" (PS 13).

Harry also commented from time to time on some cues used to aid memorisation of the piece. Sometimes he relied on hand position: "I will try to remember that position" [bar 5 to 7 – position of the chords] (PS 5). In fact, he drew symbols on the score to remind him of specific hand positions and to cue him visually about where to place the hand:

> So I've just got to the second page there and I am just going to draw a box around the two left notes to remind me about the position. This is a notation I've just come up with quite recently, I am just drawing box around these notes to remind me of the position…it helps me, so, that's why I did the box there (PS 2).

He also found it beneficial to listen to melodic lines between the superior notes of the chords "So I've got to really listen for that chromatic [line]" (PS 7). The ending of the piece was mainly memorised through aural memory:

> I am trying to really memorise this bit [bar 36 to 41] by the sound of it, so try to ear each note[…]so I am just going to keep doing this until I memorise the sound of it. (PS 6)

The pianist actually mentioned in the first interview relying heavily on aural memory for memorisation. He noticed that for certain pieces, aural memory just develops spontaneously and very quickly and is actually enough to memorise the music.

Focus on Basic Issues. During the first learning period, Harry commented frequently on rhythmic issues. The highest percentage of annotations in the first score was also related to rhythm. This was the dimension that most troubled Harry in the first stages of learning, because the rhythmic writing was confusing and the random placement of

rests hindered his rhythmic perception: “What is this rhythm? I am struggling with the third bar of the second line. It seems to be rather…” (PS 1). As time progressed, Harry stopped commenting so much on this issue, mainly referring to it when he confused or forgot a specific rhythm.

Harry also commented frequently on specific notes and accidentals. He noticed how sometimes his hand would automatically assume the presence of notes not actually written on the score: “Marking a lot of accidentals, because I tend to…I guess my hand just automatically assumes they will be there when they are not” (PS 1). Harry also commented on basic actions in performing the music, such as fingering and hand positions. His fingering choices mainly related to decisions about which hands should perform specific notes. Hand positions became important cues to remember specific bars of the piece. Finally, Harry also made a few comments about the middle pedal, but mainly related to the practical issues he was facing with the pedal in the grand pianos he was practising on: “The middle pedal is not working well” (PS 3). Similarly to Emma, Harry was also aware of the importance of practising with the sustain pedal to become familiar with the resulting sound, which was altered as the notes of the first chord were sustained throughout the piece.

Focus on Interpretative Issues. Although Harry focused primarily on basic dimensions during practice, he commented from time to time on interpretative issues during the first and second learning periods. Sometimes he focused on dynamic work, and at others on sound quality. Actually, when he concentrated more on this last dimension he noticed how his memory of the piece improved: “I felt that when I was concentrating on the sound rather than the notes, I actually got more notes right, which is weird! But helpful! So I am going to do that...yeah, more of this practice basically” (PS 4).

Nevertheless, in the second learning period Harry commented twice on sound quality and stopped talking about this dimension near the performance. The small number of interpretative comments may be explained by Harry’s perception of meaning in the piece. In the final interview, he explained that the music was not as involving or narrative as the repertoire he is used to playing:

> I think it was specific to this one. Most of the music that I play isn’t like this, it’s more kind of involved, if you know what I mean. This is a bit events’ based. Most of the music that I play is more kind of narrative, so it’s not necessarily, it’s a bit more obvious, if you know what I mean (Final interview, p. 503, lines 5173-5176).

The difficulty in identifying a narrative meaning and involvement in this music may explain why Harry did not think as much in interpretative and expressive terms. Moreover, the nature of the task, with the main goal of memorisation and the less familiar procedures, such as self-recording, also appear to have affected the process.

Search for Structural Meaning. In 394 comments, Harry only commented 16 times on perception of structural meaning. During the first learning period, he noticed the existence of repeated notes between the chords: "And these are the same notes [last chord bar 33, bar 34] for the last chord, so I am going to draw these lines which I use to tell me is the same note" (PS 2). Later, he noticed that several repeated notes belong to the first chord: "Ok, I think I am going to mark in some of the chords that have a lot of sustain notes in them, so for example the last bar, the last chord of the first line, second page…this is sustained" (PS 4).

When his focus turned to memorisation in Session 5, Harry attempted to find some sense of structural meaning and searched for the existence of structural boundaries, such as phrases. He noticed that deciding this structural division could be helpful, because his tendency was to start from the beginning: "Ok I need to really decide where the kind of long phrases are. I don't know if that might make it easier because at the moment I am just starting from the beginning all the time" (PS 5). In Session 6 he actually felt a sense of closing in bar 10 and associated to a sort of phrase: "Ok, I think from there from where I started to where I finish [bar 12] or maybe two bars before I will think of that as a phrase [bar 10], or a sort of phrase" (PS 6). In the subsequent session he reflected on the rhythmic structure of the piece and decided to follow a binary division of the music:

> I started hearing it more in a kind of 4/4 time…maybe that is something that I cannot…it seems to flow better…I mean that is something I usually do in more conventional repertoire is to try and get in multiple bars, but since this is a bit fragmentary I was not doing that, but it kind of happened…hmm, and it was helpful…so, yeah, maybe I will kind of think in 4/4 for now, so 41 bars…hmmm [sang rhythm in 4/4]) …I think the first page fits quite well into just two-bar units, from the beginning. So I am going to try that. (PS 7)

This binary perception is very interesting when compared to the ternary interpretation reported by Sophia (see case study 2). As suggested by Meelberg (2006), individuals perceive structure in a much more arbitrary way in this type of music.

Despite Harry's attempts to find some structural meaning in the first stages of memorisation, these ended up not working very effectively for him and he actually stopped commenting on this issue in the last stages of practice. In fact, he never annotated any structural decision on the scores. In the last interview Harry reported not seeing a clear structure in this piece and didn't identify any specific structural points. He noticed that in this music he could not find any register deviations that would clearly suggest a sense of structure:

> I guess I don't have a structure because I don't have an organisation only and I think this happens in this piece, because this is, minus the exchanges, just notes, there is not much deviation in say registers. So, you've got really to just know the notes, which is something I don't know very well [laugh]. (Final interview, p. 502, lines 5180-5183).

Nonetheless, he noticed that maybe a more thorough search for structural meaning might have helped:

> I guess that was again another thing I should have really searching instead of just going four bars…again maybe that was because I was too focused in my practice, as opposed to…(Final interview, p. 501, lines 5167-5169).

Harry insists once more on how the nature of the research task affected his natural process of learning. The deliberate thinking about memorisation imposed by the request to perform the piece by heart actually disturbed this pianist and affected the way he naturally copes with music.

Thoughts During Performance. After performing the piece by heart, Harry noticed how extraneous fear of memory failure dominated his thoughts during performance. When asked what he was thinking about he said: "Don't mess up…don't mess up [laugh]. I guess you could say, the beginning of the third line I was trying very hard not to forget that one, but I did" (Final interview, p. 501, line 5128-5129).

The beginning of the third line was exactly the location Harry had struggled with a few days before the performance. The awareness about this weak spot in terms of memorisation generated a fear of memory failure that actually dominated Harry's thoughts in performance and resulted into a memory slip at this exact location:

> I guess you could say, the beginning of the third line I was trying very hard not to forget that one, but I did. And also the odd place in which the triplets come, in the rest of the third line. You will see my practice where, in the second page, if I can start in the right place I did have it memorised, but it was just this one line. Well, what I think I would have needed to do is, you know, have more points in which I could restart. So for example, the third bar of the second page, there is a place I can aim towards and restart if I don't get that (Final interview, p. 501, lines 5128-5134).

When reflecting on the experience, Harry noticed that his main mistake was not to prepare safe points to recover from memory slips. This experience made him acknowledge the importance of combining spontaneous memory with content-addressable memory of specific locations. Harry also noticed that he needed more time and space to work on this specific problem:

> I have been practising quite a lot, at the end of the second line where these suddenly few notes, I have been practising going from there, but I think the kind of space that I had [in terms of time space] has just made stop thinking as much (Final interview, p. 501, lines 5143-5146).

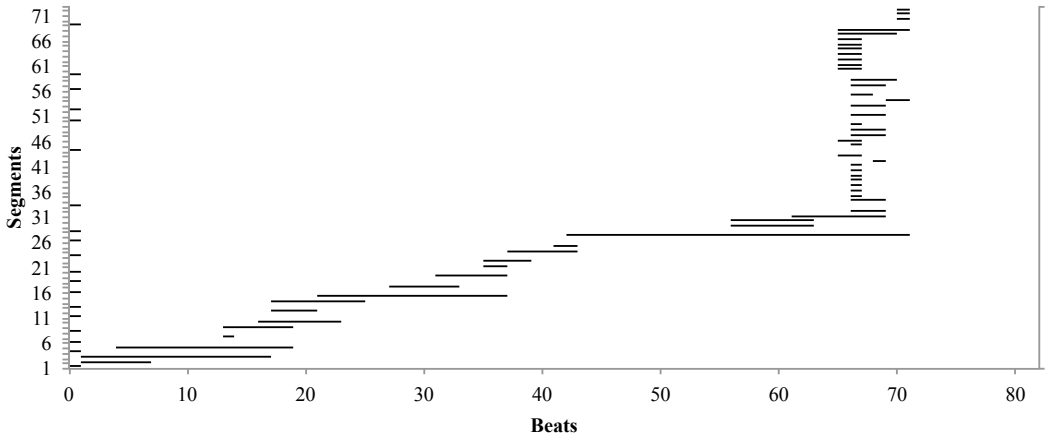
In the first interview Harry noted that spontaneous aural and motor memory chains are reliable enough to perform confidently by heart. However, in this particular piece and within this time frame, they were just not enough.

5.3.3.2 Analyses of Practice Behaviour

Harry provided 13 video recordings, which were transcribed using SYMP and divided into three learning periods: (1) *Exploring* – Sessions 1 to 4; (2) *Deliberate memorisation* – Sessions 5 to 8 and (3) *Memory consolidation* – Sessions 9 to 13.

Learning Period 1. During this period Harry relied on segmented practice, frequently following a forward approach and singling out difficult bars for practice (Figure 42).

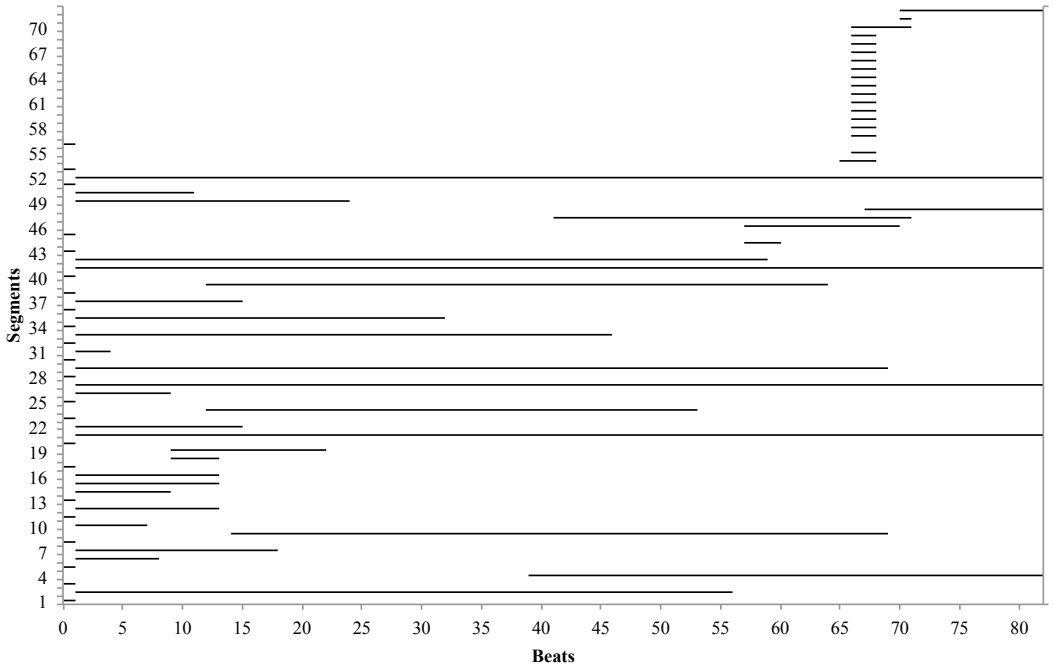
Figure 42. Practice Graph from Session 2.



He explored the piece by practising mainly with hands together (77.38%) and mainly looking at the score (96.07%). In Session 8 he was actually able to play relatively well by heart.

Learning Period 2. During this period he started interspersing work on small and larger segments and playing from beginning to end (Figure 43). Moreover, he continued singling out difficult bars for practice.

Figure 43. Practice Graph from Session 5.

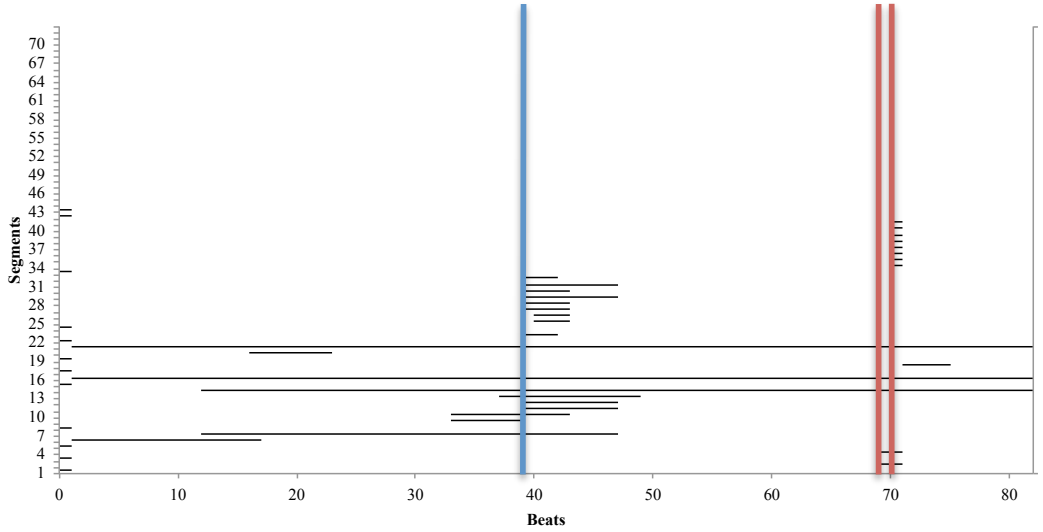


During this period, Harry always practised with hands together. Even though his main goal was to play by heart, he continued looking more often to the score than playing without it (60.85% with score), because he was still confusing many notes and rhythms and feeling constantly the need to look at the score while playing.

Learning Period 3. Harry targeted wider segments of the music and did more run-throughs of the piece. Figure 44 illustrates practice during this period, interchanging run-throughs and work on short fragments. The graph suggests a tendency to start at the beginnings of pages and in difficult bars. Once again, Harry practised everything

with hands together and practised 57.7% of segments by heart and 42.28% while looking at the score.

Figure 44. Practice Graph, Session 13. The Blue Line Represents the Beginning of the Second Page and the Red Lines the Beginning of Difficult Bars.



The video recordings actually show that Harry was never able to play accurately the piece by heart from beginning to end before the performance. Still, the pianist felt he needed to end the research study because of time constrains.

Relationship Between Harry's Reports and Practice Behaviour. Following the same procedure for the case studies reported above, multiple regression analyses assessed the relationship between Harry's reports and practice behaviour. Six predictors were drawn from Harry's self-reports. Because he didn't explore a variety of dimensions during practice, the main predictors found were score layout, difficult bars and a few structural boundaries identified in some practice sessions.[38] The six predictors selected for analysis were included in linear regression models with numbers of starts, stops and repeats in each practice set as outcome variables. The models with repeats were not significant and, for this reason, are not included in this discussion. Tables 35 to 37 indicate the regression coefficients for the effects of the predictors on starts, stops and repeats during practice. The tables demonstrate how the selected

[38] All predictors presented non-significant correlations with each other (r <.21).

predictors were able to predict Harry's behaviour during learning process. The resulting regression models accounted for between 20% and 65% of the variance in the data. Out of the 36 possible effects of the predictors, seven were significant at the p<.001 level, two at the p<.01 level and one at the p<.05 level.

Table 35. Regression Coefficients (Unadjusted) for the Effects of Structural Boundaries, Score Layout and Difficult Bars on the Number of Starts in Each Practice Session Set, with R^2.

Starts

Learning Phase	1. Explore	2. Deliberate Memorisation	3. Consolidate Memory
Session set	1–4	5–8	9–13
Page layout			
Page – Beginnings	36.69***	38.00***	22.48***
Page – Ends	-1.31	-0.10	-0.52
System – Beginnings	-1.38	0.74	6.78**
System – Ends	0.94	4.25	1.73
Difficult bars			
Difficult passages	31.29***	9.07**	-2.22
Decisions			
Structural decisions	1.69	2.00	6.48*
R^2	**0.65*** **	**0.62*** **	**0.51*** **
***** p<.001, ** p <.01 * p<.05**			

Table 36. Regression Coefficients (Unadjusted) for the Effects of Structural Boundaries, Score Layout and Difficult Bars on the Number of Stops in Each Practice Session Set, with R^2.

Stops

Learning Phase	1. Explore	2. Deliberate Memorisation	3. Consolidate Memory
Session set	1–4	5–8	9–13
Page layout			
Page – Beginnings	-1.81	-1.68	-1.68
Page – Ends	5.70	25.82***	25.82***
System – Beginnings	-4.24	0.59	0.59
System – Ends	3.20	1.82	1.82
Difficult bars			
Difficult bars	26.76***	2.92	2.92
Decisions			
Structural Decisions	2.70	4.32	4.32

R^2	**0.34*** **	**0.38*** **	**0.38*** **
**** p<.001, ** p <.01, * p<.05**			

Table 37. Regression Coefficients (Unadjusted) for the Effects of Structural Boundaries, Score Layout and Difficult Bars on the Number of Repeats in Each Practice Session Set, with R^2.

Repeats

Learning phase	1. Explore	2. Deliberate Memorisation	3. Consolidate memory
Session set	1-4	5-8	9-13
Score Layout			
Pages- Beginnings	19.76*	8.33	-4.90
Pages- Ends	-10.25	-3.17	1.11
Systems-Beginnings	1.07	4.06	2.42
Systems- Ends	4.75	4.08	-2.39
Difficult passages			
Difficult passages	23.74**	9.33	1.75
Decisions			
Structural Decisions	11.25	2.06	-0.89
R^2	**0.20****	**0.08**	**0.04**
**** p<.001, ** p <.01 * p<.05**			

All significant effects are positive, revealing that Harry tended to start, stop or repeat more at these specific locations. Table 38 summarises the significant effects found in the multiple regression analyses.

Table 38. Summary of Significant Effects (p<.01*) of Structural Boundaries, Score Layout and Difficult Bars on the Frequency of Starts (B) and Stops (E), with Effects on Starts Highlighted and Effects on All Two Measures at the Same Time in Bold Italics

Learning Phase	1. Explore	2. Deliberate Memorisation	3. Consolidate Memory
Session set	1–4	5–8	9–13
Page layout			
Page – Beginnings	S	S	S
Page – Ends		E	E
System – Beginnings			S
System – Ends			
Difficult bars			
Difficult bars	**SE**	S	
Decisions			

Structural decisions	s

**Effects on starts, stops and repeats that were significant at the p < .01 are shown in capital letters while effects at the p <.05 levels are represented by lower cases b, e and r.*

The results of the regression analyses confirm an unsystematic approach to practice. During the first period, even though Harry mentioned isolating specific systems in the score for practice, it was possible to notice in the recordings that he would usually just continue playing, not committing to his initial goal. Moreover, he recognised that his tendency was to start from the beginning; this trend is reflected in these analyses of practice behaviour. Although the pianist didn't comment much on bars he was struggling with technically, he did single them out for practice as demonstrated in the practice graphs discussed above and the regression analyses.

In the second period, the effects were similar, suggesting that the pianist was mainly starting at the beginning of pages and difficult bars and stopping at the end of pages. This result contradicts Harry's concurrent comments, because he actually mentioned his intention to work on separate systems of the score. Nevertheless, starts or stops in systems were not reliable enough to show effects in the analyses. As mentioned before, it was possible to observe in the recordings an inability to commit to his goals and and to concentrate properly, which usually resulted in playing more than the pianist had actually set out to do. He commented on how he "zoned out" sometimes, and this was reflected in his practice behaviour.

Nevertheless, in the last period, the effects of score systems and structural points started to emerge. These results suggest that, over time, Harry was adopting a more consistent and hierarchical approach to practice, which could probably have led to the development of a retrieval scheme. However, there was just not enough time to complete the memorisation process and, therefore, the resulting solution found by this pianist to commit this piece to memory became unclear.

5.3.3.3 Summary

Harry attempted to memorise Berio's *Leaf* in a period of one month. This pianist did not find enough time to dedicate to this piece, due to other performance commitments. Harry dedicated 13 practice sessions until he felt he would be able to perform by heart. However, during performance he had a major memory slip and was only able to perform the music with 50% accuracy. Unlike the other two pianists, Harry had performed several non-tonal pieces by heart before this study, but his

approach to memorisation did not reveal itself to be effective for this piece, at least within the available time frame.

In the first interview he reported having no practice method and relying on incidental memory. However, the nature of this research task, which set memorisation as the main goal and imposed self-reflection about the practice process, completely disturbed his spontaneous approach. Curiously, he set memorisation as the primary goal only after four sessions and focused on memorising as much as he could until the performance.

Harry used a segmented approach to practice, but did not identify specific criteria to select the segments, admitting that at certain points he was selecting random bits for practice. However, sometimes he also reported relying on the score layout (systems and pages). He also mentioned his tendency to frequently return to the beginning of the piece. The analyses of practice behaviour confirmed that his approach was unsystematic, as he mainly started and stopped at beginning and ends of pages. Although he didn't comment much on difficult bars, he used them as starting and stopping points in the first and second learning periods.

In the last learning period, the effects of score systems and some structural boundaries emerged. When Harry started deliberately memorising, he found the need to find some structural meaning in the piece, but was not able to see a complete structural framework. He did find some segments that reminded him of phrases, and those places served more as starting points in the last period. Perhaps with more time this pianist could have developed a hierarchical retrieval structure for the piece, but his inability to continue the research study hindered the possibility of understanding what would happen in the next stage of memorisation.

Harry did not rely on a varied set of strategies to memorise this piece, relying heavily on repetition. In the first learning period he wrote several markings on the score, including rhythmic simplifications. He also used a metronome to help with rhythmic understanding. His annotations on the score reveal that he used his knowledge of tonal harmony to encode some of the chords in the piece. The main memorisation strategy used was repetition of different segments while progressively looking away from the score. However, he noticed that the piece was not "sticking". In his first interview he mentioned that he usually develops aural memory very quickly, but this was not the case for this piece. This difficulty is to be expected, due to the specific features of this music, described above. Therefore, he also attempted to

engage in aural and kinaesthetic imagery, although very occasionally. Moreover, he tried to employ other strategies, such as change of tempo, but they were not working. In the last period Harry started struggling with his memory of the last system of the first page. It was possible to notice in the video recordings that he felt lost, not knowing exactly what to do.

In the final performance he recognised that he was dominated by extraneous fear of memory failure, particularly in this specific system. In the end, he did have a memory slip in this location and was not able to recover fully. Harry said in the final interview that he knew he could play from beginning to end by heart, but he couldn't recover if something happened in the middle. This comment strongly indicates that he was solely relying on serial cueing. He actually recognised that preparing recovery points (in this case developing content-addressable memory) would have made the difference.

This chapter provided a very thorough description of three selected case studies of postgraduate students memorising Berio's *Leaf*. The next chapter will provide cross-analyses and discussion of results.

6 MEMORISING BERIO'S *LEAF:* CROSS-ANALYSIS AND DISCUSSION

6.1 INTRODUCTION

This chapter summarises and discusses the main results emerging from the multiple-case study presented in Chapter 5. The comparative discussion will address the time spent memorising, the learning stages, focus during practice, understanding of music structure, main strategies employed throughout the learning process and performance retrieval. The chapter also includes a discussion of how retrieval structures were developed in this context and compares the main results with the author's approach as reported in Chapter 4 and with previous studies on music memorisation.

6.2 TIME SPENT MEMORISING

No restrictions were imposed on the number of practice sessions and practice hours. Table 39 illustrates how the three pianists varied in total number and duration of sessions, and how they incorporated practice of this piece within their daily schedule. The table also includes the accuracy of their memorised performances.

Table 39. Timetable with Number of Practice Sessions, Total Duration, Months Spent Practising, Frequency of Practice and Resulting Accuracy of Memorised Performance for All Three Case Studies.

Participants	Practice Sessions	Total Duration (hours)	Months Spent Practising	Frequency of Practice	Accuracy of Memorised Performance (%)
Sophia	25	15	≈ 3 months	Three–four times a week	99.39%
Emma	18	6.93	≈ 1.5 months (1 month break in between)	Almost every day	100%
Harry	13	5.57	≈ 3 weeks (4	Almost	50%

		month break in between)	every day

Sophia was, by far, the pianist who spent the most time learning and memorising the piece (≈ 3 months, 15 hours). As mentioned in the previous chapter, this pianist had fewer performance commitments during the research period, allowing her more time to dedicate to this piece. Emma spent, in total, almost half of the time Sophia did on this piece (≈ 1.5. months, 6.93 hours). She read the piece after one mental session and three physical sessions and spent the remaining time memorising. Despite the difference in time spent memorising in relation to Sophia, they both performed from memory very accurately. Existing studies investigating individual differences among musicians claim that the quality and structure of practice is a key factor, while others argue that some innate skills and other variables such as working memory capacity also have an important role (Platz et al., 2014; Ruthsatz et al., 2008). Both pianists actually followed a similar basic approach to practice, but Sophia deliberately spent more time encoding the music in the first learning period. Moreover, she decided to memorise straight away and spend more time memorising individual segments. Emma engaged in more mental rehearsal and spent less time reading the piece. Their practice goals and approaches can account for differences in time spent memorising. However, pre-existing skills, either learned or innate, cannot be disregarded.

When compared to Emma, Harry spent a similar number of hours working on this piece (3 weeks, 5.57 hours), but actually performed less 50% accurately in the final performance. Practice quality can account for this difference. The approach to practice of these pianists was completely different. Emma's practice was deliberate, with well-defined goals and strategies. Moreover, it relied on a combination of different strategies of physical and mental rehearsal. Emma found a way to systematically structure her study, based on visual layout of the score and structural understanding. Harry, however, was not able to practice as methodically. In fact, he recognised in the first interview that he has "zero method" and just "goes with the flow". The pianist mentioned that this approach is usually effective, because memorisation happens spontaneously for him and he does not feel the need to worry about it. However, this was not the case for this particular piece, for several reasons stated bellow (see section 6.6.3).

6.3 LEARNING STAGES

Despite the difference in the amount of time spent learning and memorising the piece, the learning stages reported by the three pianists actually reveal resemblances. The analysis of their learning progress found a threefold division, which included an exploration phase followed by two learning stages more focused on memory consolidation and reinforcement.

The division of learning stages is not as detailed as the models proposed by PC theory, which are based on longer learning periods and pieces of greater length. Still, they share common features with these studies. In fact, they fit remarkably well within the division proposed by Mishra (2005) into three main stages: preview, practice and overlearning.

In the first stages, Sophia and Emma both combined an aural preview of the piece (listening to existing recordings) with a notational overview (musical analysis). This is something they both reported doing in the first interview and was not specific to this piece. Harry also mentioned his intention to listen to existing recordings, but he started straightaway exploring the piece on the keyboard. His exploration was not holistic, as he did not report any intention to sight-read the piece to get an overview. He just started exploring the music from the beginning until he felt the need to stop, already working on details such as rhythmic decoding, fingering and technical issues. The pianist actually did not report starting with a preview of the piece in the first interview, because he usually relies on rote methods of memorisation and is used to approaching the music unsystematically.

In existing studies on memorisation of non-tonal music, musicians reported relying on a combination of aural and notational previews (Chueke & Chaffin, 2016; Soares, 2015). However, there are some exceptions. The author (see Chapter 4) only relied on notational preview because there was no aural recording available. One pianist in Soares's thesis also reported starting work straight away on a short segment of Claude Vivier's *Shiraz* to obtain a first impression of the piece, and only later attempted a score overview (Soares, 2015, p. 192).

In the studies on memorisation of tonal music, some musicians have reported sight-reading through the piece (Chaffin et al., 2002; Chaffin & Lisboa, 2008). Nevertheless, such an approach does not appear to be as suitable and easily applicable to Berio's *Leaf* and to these three pianists, because the writing is much more complex

and the knowledge brought by these musicians to the task was not as related to the information provided by the score as in tonal repertoire. Mishra's model of music memorisation actually attempts to explain this difference by including one element in the model that comes before the preview stage. The author labels this element *enculturation/experience*. She argues that the musical material is not the only aspect influencing memorisation approaches. The musician's knowledge and experiences also have a vital role. Based on existing literature on music memorisation, the model recognises that the task of memorising non-tonal will be more difficult than tonal music and, consequently, will result into different approaches (Mishra, 2005, p. 76).

Mishra's model proposes that, after getting to know the music, musicians work on more detailed issues, often engaging in technical work. Mishra calls this stage *practice* and divides it into two types: *notation-based practice* and *conscious memorisation practice*. She proposes that musicians usually start with notation-based practice, focusing on processing the information provided by the score to perform accurately the musical information. Once able to perform using the notation, musicians engage in conscious memorisation of the piece. Emma and Harry's approaches fit with this description. They focused first on performing the notes and rhythm accurately with the score and later engaged in deliberate memorisation. The author's memorisation of the piece *If You Were Here* followed a similar procedure. Sophia used a different approach, by attempting to memorise straight away while exploring the piece in the written score. This appears to be related to fear of memory failure, learning styles, goals and task constraints.

Finally, Mishra's model proposes that musicians usually end the memorisation process with an overlearning stage, by continuing their practice even after being able to play by heart (Mishra, 2005, p. 84). This was exactly what Sophia and Emma did in their last stages of learning. Both used this stage to test their memory and anticipate the occurrence of memory lapses. Moreover, they both worked on developing additional retrieval cues to secure memorisation.

Harry would probably have done the same, but was forced to stop the study before being able to properly and confidently perform the piece from memory. In the last stage of learning, the pianist was still struggling with playing accurately by heart and tried to deal with a memory lapse he was having repeatedly on the first page of the score. Because he was not used to dealing with this type of memorisation problem, he did not quite know what to do in this situation and felt lost. The inability

to cope with the memorisation problems encountered, combined with the lack of time, did not allow Harry to reach the overlearning stage in this study, even though it appears that if he had more time he would have continued to overlearning the music if he could have.

In summary, the learning stages reported by these pianists, particularly Sophia and Emma, share features with reports from previous longitudinal case studies and corroborates at several points with Mishra's model of music memorisation (Mishra, 2005).

6.4 FOCUS DURING PRACTICE

All of the pianists focused on basic issues of the music throughout the learning process. In Sophia and Harry's cases, focus on these issues gradually decreased as practice progressed. Emma did not comment as much on basic issues in the second learning period, but the percentage of basic comments rose in the last period. She reported continuing to feel there were problems with some basic issues, such as rhythm, near the performance date. Nevertheless, the analysis of her annotated scores provides a different picture, revealing a decrease of focus on basic annotations, which gave rise to an increase in interpretative ones.

Despite the decreasing trend for basic comments and annotations throughout the learning process, all pianists addressed this dimension more frequently than interpretative or expressive issues. The same tendency was found for the author in Chapter 4.

In this study, the percentage of interpretative and expressive comments and annotations was very low for all pianists. Sophia was the only pianist commenting on expressive issues, such as expression of feelings and emotional content. Emma never spoke about expressivity throughout the learning process, but noted in the final interview that she thought of some phrases as more agitated or calm.

In Sophia's case, comments on interpretative and expressive dimensions rose near the performance, as she reported a shift of focus to this dimension in the last learning period. She was the only pianist making this change in emphasis to interpretation and expressivity, which may be due to several reasons. First, she practised almost twice the number of hours on this piece in relation to the other

pianists. The extra time spent on the piece may have allowed the pianist to free herself from basic issues and think more about interpretative or expressive dimensions. Harry was still struggling with memorisation near the performance and focused mainly on performing the notes and rhythms accurately. Other explanations may be related to their personal interpretation of the piece and learning styles. Emma and Harry both perceived the piece as simpler in terms of musical meaning and not as a narrative, while Sophia felt the need to find some emotional connections and intentions in the music. It is important to notice that in her first interview she mentioned that an emotional attachment has a key role in her motivation to learn or memorise a piece. This may explain why she focused more on these dimensions in the last stages of learning.

The prevalence of focus on basic issues and the low number of comments on interpretation and expressiveness differs from previous longitudinal case studies on memorisation of tonal repertoire (Chaffin et al., 2002, 2010). On one hand, the different results may be due to features in this piece, which for most pianists was considered to be not too expressive and narrative. On the other hand, the unfamiliarity with the musical language may also require more attention to basic issues throughout the learning process. In tonal music, because chords and rhythmic figurations are usually very familiar to the pianists, as well as the possibility of using standard fingerings and hand positions, musicians appear to free themselves from these features after the first learning periods and focus more on interpretation and expressivity. However, in non-tonal repertoire, this familiarity is hindered for most pianists and, therefore, seems to ask for a more recurrent focus on basic issues.

Nevertheless, caution should be taken when generalising such assumption to other pianists and other types of repertoire. Soares's (2015, p. 64) report on his own memorisation process of Messiaen's cadenza from *Oiseaux exotiques* actually noted a large decrease of focus on basic issues, accompanied by an increase of interpretative and expressive dimensions in the last periods. This difference appears to be related to the nature of basic issues at the forefront of concern in practice. The basic dimensions reported by Soares (2015) were mainly related to critical details of technique, which actually stop requiring attention as soon as they began to feel more automatic. In the studies presented in Chapters 4 and 5, basic issues also included patterns, specific notes or rhythms of the music that served as cues to aid memorisation. Moreover, the

disparities in results may also be related to the nature of the pieces and to the pianists' learning styles.

6.5 UNDERSTANDING OF MUSICAL STRUCTURE

Even in the presence of an obscure and ambiguous structure, all pianists engaged at some point with structural perception. As argued by Raffman (2003, p. 79), understanding music meaning is directly related to identification of relationships between pitch, rhythmic structure and other architectural elements such as motives, transitions or closings. All pianists attempted to find this type of relationship, although some more than others. Emma and Sophia developed a hierarchical structural framework for the piece, based on their personal understanding of rhythmic structure and feelings of tension and relaxation. Harry was not able to find such a framework, even though he felt the need to develop structural understanding while memorising the music. The pianist actually struggled to find phrases in the music, because he felt each note was leading to the next and could not find any sensations of closures in the music.

Emma and Sophia both attempted to perceive the structure during the preview stage, while listening to existing recordings and analysing the score. Emma was able to acquire a general idea of the higher levels of structure at this stage, working out the lower levels later on while practising the piece on the keyboard. Sophia felt the music was quite random during the first session and was not able to develop a structural overview straight away. Instead, she worked out high and lower levels of structure as practice progressed. The author also reported a similar approach in Chapter 4.

Both pianists noticed that their understanding of structure was very different from compositional rules and, therefore, would largely differ from that of a music analyst. Even though the twelve-tone row used as the framework to compose this piece was present in the first two bars, no pianist was able to identify the row or use it as part of their structural understanding of the piece. This validates Imberty's (1993) claim that these compositional devices cannot serve as prototypes in perception and memory. Once more it is important to acknowledge the small sample of this study and that future research should further investigate if this principle generalises to other pianists and other pieces.

Sophia and Emma reported very different structures (see Chapter 5, Figure 26, p. 226 and Figure 33, p. 254). They both divided the piece into three general sections, but the location of those sections and respective subsections is not the same. They did agree on the existence of a closing in bar 13, but Sophia considered it as the end of the first section and Emma only as the end of a phrase. They both agreed on the beginning of a new phrase in bar 17 and closing of a phrase in bar 25, but for Sophia this closing was the end of a phrase and for Emma this was the end of the first section. The remaining divisions are completely different.

The diversity of perception of musical structure between the pianists clearly illustrates that grasping the structure is not straightforward for the performer in this type of music and requires deliberate effort and creative thinking. Standard structural forms are nonexistent or altered in a wide range of non-tonal repertoire. Serial music actually follows strict compositional rules, but the musicians in this study did not identify them. In a previous study, one pianist reported intellectually recognising a twelve-tone row in Boulez's music, but did not use it directly for encoding and retrieval, relying more on visual layout of the score (Soares, 2015).

In this case musicians, cannot simply associate their knowledge of structural forms to perceive musical organisation, because the way it is structured does not follow standard schemes. This results in varied and creative ways of perceiving and organising structure based on the musicians' performance experience of the piece. Theoretical analysis can indeed inform memorisation, as illustrated in previous longitudinal case studies (Chaffin et al., 2002; Chaffin & Lisboa, 2008). However, perception and imagery of music structure can take a wide variety of forms, particularly when the formal structure is not obvious for the musicians. Ginsborg (2017, p. 83) mentions this issue, claiming that "musicians' perspectives on the compositional structure of the works they are memorising do not necessarily have to reflect those of their composers or a musicologist's analysis, of course; the identification of musical features is most likely to be useful when carried out by musicians themselves". This discussion also recurs in the field of musical analysis. Rink (2015, p. 129) argues that structure "should be understood first and foremost as a process, not as 'architecture' – especially in relation to performance. Musicians infer structural relationships in the piece based on their individual interpretation of the piece. Of course, sometimes previous knowledge of standard musical architectures can result into common perceptions of structure" .

Either by using knowledge of standard musical architectures or by individual interpretation of the piece, structural understanding does seem to have a vital role in memorisation, even in non-tonal repertoire. Emma, Sophia and the author (see Chapter 4) used such understanding to encode non-tonal pieces. Analyses of practice behaviour confirm this claim (see Section 5.3.2.2 and Section 5.3.1.2). In the author's case, a recall test also demonstrated that structural boundaries became landmarks in LTM. Harry was not able to perceive music structure, but actually felt the need to do so throughout the memorisation process and recognised in the final interview that such understanding could have been very helpful.

6.6 LEARNING AND MEMORISATION STRATEGIES

6.6.1 Segmentation Strategies

Existing research on music learning and memorisation has found that musicians use a variety of strategies to segment music information, according to their level of skill, training or task difficulty (Hallam, 1997; Mishra, 2005; Nielsen, 1999). Mishra (2002) has identified four main strategies: serial, holistic, segmented and additive (see Chapter 1). Existing studies on music memorisation have reported that novices tend to use serial strategies more (Hallam, 1997), while skilled musicians usually follow segmented strategies (Ginsborg, 2002; Gruson, 1988; Nielson, 1999; Williamon & Valentine, 2002; Chaffin, Imreh & Crawford, 2002; Mishra 2005).

In this study, all pianists followed a segmented approach. They started working on short segments of the piece at a time and later started alternating between exhaustive work on small segments and work on larger units, or run-throughs of the piece. Even though the piece was very short, the large amount of less familiar information actually felt quite overwhelming for all pianists in this study. They all reported using deconstruction strategies, by working on very small amounts of information (e.g., single bars) and later combining them into larger portions of the piece. Such a strategy was also reported by the author in Chapter 4 for the piece *If You Were Here*, and by Soares (2015, p. 45) for Messiaen's *Oiseaux Exotiques.*

In the first interview, both Sophia and Emma reported using the segmented

strategy, so this was not specific to this piece for them. Harry did not mention any specific method in the first interview, highlighting that his approach is usually not systematic, but in this case he felt the need to isolate portions of the piece because he was feeling overwhelmed with the large amount of information and noticed that incidental memorisation was not taking place.

All pianists appeared to have started with smaller practice segments and progress to longer segments in the last stages of learning, but they continued interspersing smaller and longer segments. Such a tendency was also found in previous studies by Miklaszewski (1989, 1995) and Williamon et al. (2002)

The pianists in this study used common criteria to segment the piece for practice. Particularly in the first stages of learning, they all relied on visual representation of the score to select portions of the piece for practice. All pianists reported targeting specific systems or pages of the score. The analyses of practice behaviour also reveal that all pianists used beginnings and ends of systems and pages consistently as starting or stopping locations. This appears to have been Harry's main criteria for the selection of segments, even though his approach was not very systematic. Emma used these score boundaries consistently during the first period and Sophia used them to segment practice in the first and last learning periods.

Previous literature on learning and memorisation has rarely addressed visual layout of the score as criteria for the segmentation of practice. Nevertheless, in this thesis, all pianists relied on such visual representation, particularly in the first learning periods (see Chapters 4 and 5) and the professional pianists interviewed in the first study also mentioned its importance (Chapter 3). Soares (2015) claimed reliance mainly on score layout to divide one of Boulez's *Notations* for practice, because the structure was very obscure. The visual representation of the score, if well organised, can also provide a ready-made framework to segment practice. Nevertheless, its effect on memory retrieval remains unexplored. In this study, no pianist reported using visual boundaries of the score layout as memory cues during performance. The author also did not use these types of boundaries as cues and they were not remembered more than other locations in the long-term recall test (see Chapter 4). This suggests that repetition, starts and stops during practice are not the only factors involved in the establishment of a retrieval cue.

As was previously stated, the personal structural division of the piece into sections and subsections was an important criterion for Sophia and Emma to segment

practice. As mentioned above, they developed a personal interpretation of structure and saw the piece as divided into sections and lower-level subsections and phrases. Both pianists used the perceived structural boundaries to organise practice, as demonstrated by their self-reports and analyses of practice behaviour. They also reported thinking about some of these structural boundaries during performance, suggesting that they were used as structural PCs. The analyses of Emma's practice behaviour clearly demonstrate her gradual change of focus from the visual layout of the score to structural phrases and, later, to wider sections. This corroborates with results presented by Williamon & Valentine (2002, p. 507), which first suggested that use of structure as segmentation criteria increases as learning progresses. They also confirm these author's claim that "skilled performers shift their focus of attention between levels of musical structure, and that this attentional shift relies on an integrated conception of that structure".

As previously stated, Harry was unable to find a sense of structure in the piece, with only a small realisation of some short phrases that he attempted to think about during deliberate memorisation. These phrases were actually used more consistently as starting places in the last stage of learning. Perhaps if Harry had the extra time he needed to complete memorisation of the piece, this structural understanding could have been used more to segment practice.

Finally, all pianists in this study also singled out difficult passages for practice. The three pianists considered bars 33 and 35 to be the most difficult to perform in technical terms, and started and stopped more often at these locations at some point during the learning process. Williamon and Valentine (2002) reported a similar result, but in their study pianists focused less on difficult bars as practice progressed. In this study, some pianist actually continued feeling the need to single out those bars for practice until the last performance.

6.6.2 Meaningful Encoding of Music Material

All pianists in this study engaged in meaningful encoding of musical material. This was particularly evident for Sophia. This pianist spent the first learning period developing conceptual, visual and sonorous associations to encode the chords comprising this piece. Whenever possible, she associated new information with her

knowledge of tonal harmonies, scales or intervals. The pianist actually mentioned in the first interview that memorisation becomes much more difficult when new information cannot be directly related to such patterns. This association was not only useful during the first encoding stages, but also during deliberate memorisation of these elements. When the association was not effective, Sophia found meaning by focusing on sound or expressive quality, or on visual representation on the keyboard.

Harry did not comment about tonal patterns during practice, but actually annotated the name of tonal harmonies on the top of some chords in the first score (see Figure 41, p. 274). This demonstrates that he was also using his knowledge of tonal musical vocabulary to give meaning to these chunks. The search for tonal meaning in non-tonal information was also reported by the author in Chapter 4, by professional pianists interviewed in Chapter 3, and has been repeatedly mentioned in studies on memorisation of non-tonal repertoire. Soares (2015) reported using a strategy named "intervallic cueing", which consisted of associating motifs of the piece with existing knowledge of tonal patterns. The pianist used this strategy not only when encoding the motifs, but also as a memorisation aid, by thinking about the motifs as meaningful chunks related to his previous knowledge of tonal elements (Soares, 2015, p. 75). Other pianists in Soares's study also reported a similar strategy (*idem,* p. 194). Such meaningful association was similarly found by Tsintzou & Theodorakis (2008) who observed experienced pianists in their study using stored knowledge of tonal chords, scales or structural forms to meaningfully encode the new information (Tsintzou & Theodorakis, 2008, p. 8).

Emma followed a different approach when encoding the chords of Berio's *Leaf*, as she made no attempt to connect them to tonal patterns. This is interesting, because in the first interview she mentioned the importance of using harmonic cues during memorisation. However, this statement referred to tonal music, which can easily provide well-known harmonic cues. In non-tonal repertoire, she mentioned using a more geometric approach, based on visual positioning of the hand, instead of conceptual cues, which are easier to establish in tonal repertoire. In Berio's *Leaf* her approach was indeed more geometric, focusing only on the lines formed by superior, middle or lower notes of the chords and hand positions. Still, she engaged in meaningful encoding of the music's features, but relied more on visual representation on the keyboard.

The meaningful encoding of musical elements of the piece found in this study corroborates the idea that when musicians learn a new composition, they combine knowledge of that particular piece with general knowledge brought to the task that results from a varied scope of experiences. This is a premise often proposed in the literature on memorisation (Chaffin et al., 2002; Mishra, 2005; Sloboda et al., 1985). During their years of training, musicians spend a long time learning music theory, which develops comprehension and retention of music patterns, comprising a music vocabulary that recurs in several pieces. Although this vocabulary is generally distorted or absent in non-tonal music, it appears that musicians still make use of such knowledge to meaningfully encode the new information. If an association is not considered useful or accessible, musicians can engage in more creative encoding, by relying on visual or sound features of the new elements.

6.6.3 Incidental versus Deliberate Memorisation

In this study, all pianists engaged in deliberate memorisation of Berio's *Leaf* at some point during the learning process. Sophia started memorisation from the very first session and Harry and Emma after a notational overview of the piece (Mishra, 2005). Previous studies on music memorisation have found that some musicians rely on incidental memorisation for pieces of short length and high simplicity (Hallam, 1997). This was not the case for this piece, because even though short, it imposed several challenges on encoding, because of the lack of familiar music vocabulary and the difficulties in developing aural and kinaesthetic memory.

Sophia and Emma reported engaging in deliberate memorisation in the first interview, so they relied on their usual method of memorisation. Harry was used to relying on incidental memory for all types of repertoire. In Berio's *Leaf*, however, his approach was very different, as he started deliberate memorisation attempts very early in the learning process. In the final interview he explained that this was a consequence of the nature of this research task, because he focused too much on the goal of committing the music to memory. Moreover, the self-reports to the video camera and the feeling that he was being observed made him very aware of everything he was doing in practice. Although this has been reported by other

musicians as being beneficial (Chaffin & Crawford, 2007), in Harry's case the process highly disturbed his natural learning process.

Other factors appeared to be involved in Harry's difficulty in developing incidental memorisation. First, he struggled with developing auditory memory of the piece. In the first interview, this pianist mentioned that he was actually very confident about his aural memory abilities. However, in the last interview, after attempting to memorise Berio's piece, he noticed how he struggled to develop this type of memory and actually thought that this music was not meant to be memorable. Actually Chaffin et al. (2002) foresaw that sometimes auditory memory can be taken for granted by musicians used to memorising pieces with standard patterns, and that this absence can cause serious difficulties (Chaffin et al., 2002, p. 37).

Finally, it became clear that Harry needed more time to develop memorisation of the piece. Perhaps if there had been no time pressure, he would have followed his natural learning approach until kinaesthetic and aural chains eventually began to take place. Unfortunately the inability of this pianist to continue the research study did not allow a complete picture of the memorisation process. Further research can explore whether incidental memorisation can indeed be an effective strategy in this type of repertoire.

Even though Harry felt forced to think deliberately about memorisation, he struggled with finding strategies to deal with the problems encountered. In fact, he mainly relied on unsystematic repetition of different segments. Sophia and Emma also used repetition as a practice strategy. However, in their case, repetitions were often systematic and controlled, using a specific number of repetitions or a varied array of exercises, depending on the type of problem encountered. Sophia frequently ensured coordination of thoughts and finger actions while repeating specific passages, particularly during the memorisation stages. The author also reported this strategy in Chapter 4.

6.6.4 Combination of Physical and Mental Rehearsal

Throughout the learning process, all pianists reinforced physical practice with mental rehearsal. This combination has been thought to be supportive for effective memorisation (Davidson-kelly, 2014; Rubin-Rabson, 1937, 1941). In this study, the

pianist who relied most on mental rehearsal was Emma, practising a total of 1 hour and 22 minutes away from the piano, against 5 hours and 11 minutes physically engaging with the instrument. This is not surprising because she mentioned in her first interview the important role of mental rehearsal in her practice routines. Sophia stopped her physical practice occasionally to engage in mental practice (mental rehearsal – 7.23 min; physical practice – 14.87 h). Harry's practice was mainly physical (see Table 31, p. 264).

Sophia and Emma used this type of practice in their very first contact with the piece, with the aim of previewing the piece. Both analysed the score while listening to existing recordings. Other pianists have reported similar approaches in non-tonal repertoire (Soares, 2015; author, Chapter 4). Musical analysis at the initial stages of encoding has often been reported as an effective strategy in the literature on music memorisation (Aiello & Williamon, 2002; Ginsborg, 2004; Hallam, 1997; Rubin-Rabson, 1937).

Emma also used mental rehearsal at this stage to prepare the score for physical practice by decoding the rhythms on the score and indicating the location of the different pitches in the rhythmic subdivisions. Sophia prepared the score visually by marking important elements with different coloured pens. The use of colour markings to support encoding of the piece was also reported by a pianist in Soares's study (Soares, 2015, p. 192). Sophia used mental rehearsal in the first stages to work out rhythms, by stopping physical practice to analyse the rhythmic structure and sing it while marking the pulse. Both Emma and Sophia stopped physical practice to sing several times the internal notes of the chords or melodic lines between them.

All pianists used mental rehearsal to aid memorisation. Emma started deliberate memorisation with a mental rehearsal session where she listened once more to the music to familiarise herself aurally with the resulting sound. During deliberate memorisation she used aural (imagining aurally the music) and visual (imagining the hands playing on the keyboard) imagery techniques to help commit the piece to memory. Harry also decided to attempt aural and visual imagery, because memorisation was not developing as spontaneously as he had hoped. Sophia used a similar approach for a specific system that she was struggling to memorise.

As proposed by the professional pianists in Chapter 3, mental rehearsal can be an important tool to work out the complexities of this repertoire by preparing, for example, the score for practice, but also as an aid to memorisation. Several studies on

this topic have suggested that a combination of physical with mental rehearsal can result in effective memorisation (Bernardi et al., 2013; Davidson-kelly, 2014; Lim & Lippman, 1991; Rubin-Rabson, 1937). Previous studies examining in depth the development of retrieval structures in musical memorisation have mainly collected data for physical rehearsal (Chaffin et al., 2002, 2010; Chen, 2015; Chueke & Chaffin, 2016; Ginsborg & Chaffin, 2011a; Soares, 2015). This was the first study of this sort allowing the participants to freely engage in mental rehearsal. More research should now be undertaken to further explore the use and effectiveness of this combination in non-tonal repertoire.

6.6.5 Memory Cues

The three pianists deliberately established a set of localised cues to aid memorisation of specific musical elements. Sophia used a wide range of cues to remember chords of the piece, associating them with tonal patterns, or focusing on their sound quality or expressive effect. Soares (2015) also reported using sound perception as a cue, but in his case combined sound perception of the element with other cues such as hand shapes, naming this strategy *sonic-resonance cueing* (Soares, 2015, p. 141). Sophia relied on specific notes, rhythms, fingerings or hand positions to guide her memorisation process. Other important cues for this pianist were melodic contour (e.g., triangular motion between the superior notes of some chords) and contrapuntal motion (e.g., parallel movements between some voices).

Emma focused on specific notes or accidentals to cue her memory of some sections. Other times she relied on visual representation of hand shapes. According to Soares (2015, p. 141), this is a strategy that can be used across a wide range of non-tonal repertoire. Emma also relied on rhythmic counting to cue memorisation. This strategy was reported by Sophia, Harry, the author, Li (2007) and Soares (2015) in studies on memorisation of non-tonal music. Ginsborg (2002) also reported beat counting as an effective memorisation strategy for singers. Finally, Emma saw melodic lines between superior, middle or lower notes of the chords. Sometimes she noticed the chromatic melodic contour of some upper notes and used it as a cue to memorisation, and often sang upper or lower notes of the chords. Although Harry was the pianist who developed the fewest memory cues, he also reported relying on

visual representation of hand positions and on chromatic movements in some melodic lines.

Emma and Sophia both verbalized memory cues during practice. This strategy relates to a technique called *verbal association* by Soares (2015), which consists of thinking about the verbal word associated with a specific element of the music (Soares, 2015, p. 199).

In previous longitudinal studies, several cues appear to have developed intuitively while working on the piece. However, in this study, the pianists deliberately established localised cues of varied types to aid memorisation of particular locations in the piece.

Sophia appeared to have even taken a step forward by deliberately organising these cues into a retrieval structure to keep track of her memorised performance. In her final interview she actually mentioned the preparation of a safety net with several recovery points, mainly related to her understanding of music structure. Additionally, in the final sessions she prepared thoughts for performance, deciding which cues she would think about during retrieval. The analyses of her practice behaviour confirm that the higher levels of this retrieval structure were used to organise practice. Emma did not deliberately comment on this, but her practice behaviour also suggests that she was developing a retrieval scheme with structural and basic cues to keep track of memorised performance. Harry was the only one who did not prepare a safety net for performance, but he actually mentioned in the final interview how he regretted not developing safety points, because he was not able to recover from a major memory slip during the performance.

6.7 PERFORMANCE RETRIEVAL

Sophia and Emma were able to provide very confident and accurate memorised performances, while Harry suffered from major memory slips, which resulted into 50% of inaccuracy in performance. Their self-reports about thoughts during performance help understand what happened during memory retrieval, namely the thought-processes employed to avoid or recover from memory failure.

The first two pianists reported a combination of prepared and spontaneous thoughts. Their prepared thoughts resembled performance cues previously reported in

longitudinal case studies contributing to PC theory (Chaffin & Imreh, 2002; Chaffin & Lisboa, 2008). The analyses considered them PCs because they correspond to features of the music that were focus of attention during practice. Both pianists reported thinking about basic PCs, such as notes of specific chords, melodic contour, rhythm and hand shapes. Structural PCs related to their subjective understanding of music structure. Sophia also reported one expressive PC.

Finally, Sophia and Emma also reported having spontaneous thoughts during performance, related to spontaneous perception of the resulting sound. As suggested by Ginsborg, Chaffin & Demos (2012, p. 201), "PCs are prepared during practice to provide the mental landmarks needed for a secure performance while spontaneous thoughts reflect more transitory experiences and insights".

Harry was obviously not as confident during performance as the other pianists, and he was dominated by fear of memory failure. His main thought was "don't mess up" (final interview). The pianist was worried about the third system, which was causing memory problems in the last practice sessions. In fact, he had a memory slip in that specific place and was not able to fully recover until the end of the performance. While retrospectively thinking about the performance experience, he mentioned that his mistake was not to have prepared any recovery places to jump ahead to in case of memory failure. Although he could usually rely on spontaneous memory, in this piece and with the short time of practice he felt he needed a safety net.

This appears to have been one major reason for the difference in accuracy between Harry and the other pianists. In fact, he practised a very similar number of hours as Emma, but the reliance on motor and auditory memory alone, and the absence of a conceptual security network did not allow this pianist to keep track of his memory during performance and recover from memory slips. Emma did not have any memory lapses, so it was not possible to see if she would be able to recover in case of memory failure, but Sophia actually had a slight doubt at one point and continued confidently.

Harry's performance was an example of the importance of developing a mental safety net, with several locations in the piece serving as recovery places in case of memory failure, as proposed by PC theory (Chaffin et al., 2002; Ginsborg et al., 2012).

6.8 CONCLUSION

The first aim of this study was to examine the development of retrieval structures in music inspired by serial composition techniques. During memorisation of Berio's *Leaf,* two pianists developed a hierarchical retrieval structure based on their personal understanding of the music's structure and on different types of PCs developed during practice. The analyses of practice behaviour demonstrated that these pianists started and stopped more often on the structural boundaries subjectively developed to divide the piece. Moreover, self-reports about the moment of performance suggest that they thought actively about some of these boundaries to guide retrieval of the piece. As suggested by Clarke (1988), Miklaszewski (1989) and Williamon et al. (2002), the pianists shifted their focus of attention between levels of structure, sometimes thinking about higher levels (such as phrases), at others about lower levels (such as specific notes). Similarly to the author in Chapter 4, criteria for practice segmentation relied on a combination of structural boundaries and score layout.

Such memorisation process can be remarkably well explained by PC theory. Even though the musicians were not familiar with the concept of a retrieval scheme or PCs, they still developed such structures to aid memorisation of the piece. They combined serial cueing developed while learning the piece with content-addressable memory of specific cues carefully prepared during practice. Harry did not form a conceptual retrieval scheme and, consequently, was not able to recover from a major memory lapse during memorised performance.

The second aim of this study was to understand how retrieval schemes differ between musicians. The elementary features of Emma and Sophia's retrieval structures are very similar and follow the premises proposed by PC theory (Chaffin et al., 2002; Ginsborg et al., 2012). The higher levels of their retrieval structures were based on their personal division of the piece into sections and subsections. The lower levels were mainly based on basic and structural PCs. However, the structural organisation of the piece was idiosyncratic in this case. As claimed in Chapter 4, in the absence of a common structural framework to hold on to, musicians engage in creative and very personal interpretations of musical structure. One could expect that in serial music, where perception of structure is limited, musicians would not rely on structural understanding at all. Harry followed such an approach, but his difficulty in

developing incidental memory due to features of the piece and lack of time resulted in a less successful memorised performance.

Finally, as predicted by the PC theory, Emma and Sophia also developed a set of PCs to guide their retrieval of the piece. Both reported basic and structural PCs and relying mainly on basic PCs, such as notes rhythms or hand shapes. Their description suggests that, even though the piece was very short, they felt the need to focus repeatedly on these basic elements of the piece to keep track of their memorised performance. Emma actually reported thinking about the top note of each chord to avoid getting lost. This reveals the high complexity of this piece in terms of memorisation, requiring constant focus on elementary aspects of the music. No pianist reported interpretative PCs and only Sophia reported one expressive PC. This pianist acknowledged the importance of thinking expressively to feel a connection with the music. Emma and Harry emphasized, in turn, that this piece was very simple and ephemeral, and that it did not make sense to think too expressively. Moreover, Harry also noticed that he was still too worried about playing the basic elements of the piece accurately. The features of the music, its high complexity in terms of memorisation and the amount of time spent practising, can help explain the low number of interpretative and expressive PCs in this case. Harry did not report the use of PCs, but actually recognised that the presence of recovery points throughout the piece would likely have made a difference in the final performance.

In Sophia's case, the analyses of practice behaviour did not find effects for PCs on starts or stops, but this appears to be due to their location in the middle of sections and subsections. The pianist did verbalise some of these cues during practice, suggesting that she was thinking about them and preparing her thoughts for memorised performance. Emma followed a similar approach.

The final aim of this study was to explore learning and memorisation strategies used by different musicians for the same non-tonal piece. Sophia and Emma followed a threefold division very similar to the one reported by Mishra (2005) in her theoretical model of music memorisation. Harry was the only pianist who didn't start with a preview of the piece before engaging into technical work.

All musicians processed the information following a segmented approach, beginning with very small segments (e.g., single bars) and later interspersing smaller and larger segments, including run-throughs of the piece. Such an approach has been

repeatedly reported in the literature on music learning and memorisation (Chaffin et al., 2002; Miklaszewski, 1989; Mishra, 2005; Soares, 2015; Williamon et al., 2002).

During the first stages of learning, the pianists engaged in meaningful encoding of the musical material. Sophia spent considerable time associating the different chords with her stored knowledge of tonal harmonies, intervals and scales. Harry also annotated similar associations in his first score. When such association was not effective, Sophia relied on sound perception and visual representation of hand shapes. Emma also relied on the last type of association, memorising the chords in a more geometric way, and only focusing on specific notes of those patterns. Even though the elements of this piece differed widely from these musicians' knowledge of musical vocabulary, they still used such knowledge to meaningfully encode the new information. Meaningful encoding of musical material is actually a key principle of existing theories in this area (Gobet, 1998, 2015).

All of the musicians thought deliberately about memorisation at some point. Emma and Sophia were accustomed to using such an approach, but Harry actually implemented deliberate memorisation for the first time. As a natural learner, who usually relies on incidental memorisation, such a change of approach actually appeared to have impact his final memorised performance.

During memorisation, the musicians relied on a combination of physical and mental rehearsal. Emma and Sophia started with mental rehearsal by analysing the score while listening to existing recordings. During memorisation all musicians attempted to engage in aural, visual or kinaesthetic imagery to aid the process.

Additionally, the three pianists developed a set of memory cues to aid memorisation of specific parts of the piece, including specific notes, rhythmic counting, melodic contour, contrapuntal motion, hand shapes and fingerings, among others. The cues deliberately developed were mainly related to basic elements of the music, although in performance Emma and Sophia also reported thinking about structural cues. Emma and Sophia practised coordination of thoughts about these cues with finger actions, by verbalising the labels assigned to those cues. Such an approach has been reported by the author in Chapter 4 and also by Soares (2005). The coordination between thoughts and actions is also an important premise of PC theory (Chaffin et al., 2002).

In summary, the analyses of practice behaviour and self-reports strongly suggests that Emma and Sophia developed a hierarchical retrieval scheme based on

their subjective understanding of musical structure and on different types of PCs. Harry's retrieval scheme was mainly based on serial cueing developed while learning the piece and, in this case, resulted in a poorer memorised performance. These results, combined with outcomes from Chapter 4, are remarkably well explained by principles of existing theories of expert memory. The association of the principles of expert memory and memorisation of non-tonal music will be now further discussed in the final chapter of this thesis.

7 DISCUSSION AND CONCLUSIONS

The main purpose of this thesis was to extend and reconsider findings from a body of research on musical memorisation highly focused on tonal music, by examining learning and memorisation approaches to non-tonal piano repertoire. A review of existing studies in this field resulted in the emergence of four main research questions (see Section 1.5), prompting the development of three studies, presented in Chapters 3 to 6.

Study 1 (Chapter 3) established the background for the thesis through an exhaustive analysis of six expert pianists' accounts on learning and memorisation of contemporary piano repertoire. This study was followed by large-scale longitudinal case studies examining learning and memorisation approaches to non-tonal piano repertoire in great depth. Study 2 (Chapter 4) reported the author's process of memorisation of *If You Were Here* for prepared piano, a 11-minute piece commissioned from the young composer Wynton Guess. Finally, study 3 (Chapters 5 and 6) described six post-graduate students' preparation of Luciano Berio's *Leaf* for memorised performance, focusing on three of these case studies in depth.

This final discussion draws together the findings emerging from these studies and is organised around the fundamental research questions posed in Chapter 1. The discussion will address the contributions of this thesis to current knowledge of how musicians encode and retrieve non-tonal musical information, reflecting on how these findings support and extend existing research on musical memorisation. Practical implications for performers and pedagogues are then considered. The chapter concludes with a discussion of the main limitations of these studies, together with a reflection about avenues for future research.

7.1 RQ1: WHAT ARE THE ATTITUDES OF PIANISTS TOWARDS PERFORMING NON-TONAL MUSIC FROM MEMORY?

Performing from memory is a well-established practice among pianists and is often a requirement in assessments and competitions (Ginsborg, 2004; Mishra, 2014). However, such a convention is not entirely applicable to non-tonal music composed

in the late 20th and early 21th centuries (Hamilton, 2008; Mishra, 2014). The reasons for not memorising new repertoire have been attributed to its complexity (Hamilton, 2008, p. 80), but have not been entirely explored.

This question was addressed in Studies 1 and 3 of this thesis by interviewing six concert pianists with extensive experience of performing contemporary music, and three postgraduate students at the Masters Level. The results highlight the diversity of pianists' views on memorisation of non-tonal music. Two professional pianists and one postgraduate student reported performing everything by heart, even the most complex styles of contemporary piano repertoire. One professional pianist also played several solo non-tonal pieces from memory, although he did not set out to memorise them intentionally. Others mentioned using a pragmatic approach, depending on the type of composition, the time available to prepare the piece, or the connection felt with the music. Some pianists in both studies reported always performing contemporary music with the score.

The diversity of reports on this topic is fascinating and intriguing. When justifying their decisions to play from memory, several pianists mentioned the tradition of performing from memory, particularly in relation to standard repertoire, noting how audiences expect them to perform without the score. Some criticised this practice, but admitted that sometimes they are inclined to favour memorised performances. Williamon (1999b) tested this tendency experimentally and provided evidence that musicians tend to favour performances without score. It would be interesting to extend this experiment to non-tonal music, given that pianists often perform with the music in this situation. Besides the convention of performing from memory, all pianists in this thesis noticed benefits from this practice, in particular deep knowledge of the music, freedom, improved listening and communication, and the ability to work the music in their mind. This confirms previous findings, as these benefits have often been reported (Chaffin et al., 2002; Chen, 2015; Hallam, 1997; Noyle, 1987).

Particularly in relation to contemporary music, several reasons were presented by pianists in Study 1 for playing this music by heart, namely (1) being fond of the act of memorising; (2) working with the music away from the piano; (3) achieving a specific performance effect, such as playing with the lights out; or (4) because they feel a special connection with a particular piece and want to provide a special performance. Some pianists noted that memorisation is not a choice, but something

that develops alongside the learning process, even unintentionally. In this case, time spent with the piece appears to be an important factor, as the reports on incidental memorisation of non-tonal complex pieces were associated to very long periods of learning.

In Study 2, the author also noticed that memorisation is very useful with pieces in a fast tempo using extended techniques, for several reasons. First, the stand needs to be removed in order to play inside the soundboard and, consequently, the score cannot be placed in its usual location. Second, the pianist engages in large and quick movements between the soundboard and the keyboard, requiring frequent change of visual attention between the different parts of the piano, limiting the ability to look at the score and turn pages. Finally, some pieces using extended techniques use unconventional score representations (e.g., circular scores in Crumb's music), which become very difficult to follow while performing.

Although numerous benefits were associated with the act of committing non-tonal music to memory, several pianists also noticed limitations. Some pointed out the extra anxiety caused by the fear of memory failure, a problem applicable to all styles of repertoire (Hallam, 1997). Particularly in relation to contemporary music, musicians in studies 1 and 3 mentioned the obstacles to memorisation presented by this repertoire, such as the lack of obvious structures and patterns, problematic writing or the recurrence of switches. Others mentioned the extra time spent memorising, which for this repertoire doesn't seem worthwhile, given the limited number of performances it usually gets when compared to more standard repertoire. One postgraduate student in study 3 reported not having enough experience with memorising this music. One professional musician in study 1 who is dedicated to the performance of experimental repertoire mentioned using the score as his first option, because he believes that it preserves the freshness in the music: the ability to keep the music unknowable and find something new in each performance.

These results reveal that the choice of performing by heart is complex and involves various factors. Even though performing contemporary music from memory is not currently an established practice, as is the case with standard repertoire, this doesn't mean that musicians do not see benefits in memorising this music, as demonstrated by the accounts reported in this thesis and by the emergent number of studies on this topic (Chueke & Chaffin, 2016; Soares, 2015; Tsintzou & Theodorakis, 2008).

7.2. RQ2: WHAT OBSTACLES DO PIANISTS FACE WHEN PREPARING NON-TONAL MUSIC FOR MEMORISED PERFORMANCE?

Accounts of concert pianists and pedagogues have suggested that non-tonal music is more difficult to memorise than tonal music (Aiello & Williamon, 2002; Gordon, 2006; Noyle, 1987). Renowned soloists and pedagogues have mentioned the absence of expected harmonies and logical motivic developments (Bernstein, 1981, p. 258; Gordon, 2006, p. 84). Others have noticed the difficulty in developing auditory memory in this music (Marcus, 1979, p. 59).

Although difficulties for memorisation imposed by this repertoire have been occasionally mentioned in the literature on this topic, no study to date had investigated this subject in depth. This thesis reports evidence from interviews and observations which can further enlighten this issue. Several features of non-tonal pieces have been identified as potential challenges for memorisation. One element that stood out was the absence of tonal patterns and well-known formal structures. All pianists in Study 1 mentioned this issue in relation to pieces written in the late 20th and early 21st centuries. Some noticed that certain composers continue using very clear principles of composition, which can help give meaning to this repertoire. However, pianists are often less familiar with these principles and have difficulty in using them to their advantage (Soares, 2015). Moreover, it is difficult to find unifying principles between composers, because they tend to use their own language and compositional rules (Thomas, 1999). All the longitudinal case studies presented in this thesis, it was possible to notice the pianists' struggle to find principles of compositions and a tendency to rely on their own perception of the music.

Several pianists in Study 1 noted that non-tonal repertoire often disrupts standard structural forms or does not follow traditional structural music divisions, such as phrases. This was actually a major difficulty for one of the pianists in Study 3, who couldn't find a structural meaning for Berio's *Leaf* and therefore struggled to develop a conceptual framework for this music.

Another challenge mentioned by most pianists in Study 1 was problematic musical writing. Some noticed that, in recent centuries, some composers have tended to base their writing solely on compositional procedures, neglecting the performative side. This can result in music not fitting particularly well under the hand, affecting the development of kinaesthetic and visual memory.

In more recent styles of repertoire, composers have also explored completely new ways of writing for the piano, such as extended techniques (Lee, 2019). Such techniques are not only visually unfamiliar to pianists, but also force them to engage in unconventional performance practices, such as plucking and touching the piano strings. To complicate learning even more, each make of piano will have different string positions, which will affect the locations where pianists perform the extended techniques inside the soundboard. The author had to deal with these challenges in Study 2, taking a long time to read the music and establish an overall picture for the piece. However, the unconventional techniques on the soundboard turned out to be quite easy to memorise. They were so distinct from the other elements performed on the keyboard, they appeared to have been automatised after only a few trials. The fast memorisation of these techniques is in line with memory theories related to items' distinctiveness, which argue that events that distinguish themselves from other items in memory tend to be more memorable (Brown et al., 2007; Schmidt, 1991).

A feature found in both pieces selected for Studies 2 and 3 was the presence of switches (Chaffin et al., 2002), which revealed themselves as a major challenge to memorisation. This difficulty was reported by several pianists in study 1 in relation to different types of contemporary piano repertoire. The author, in Study 2, almost decided to perform *If You Were Here* with the score when she found the presence of switches in every single beat of long fast passages. The pianists in Study 3 also struggled with similar chords and rhythms that had only slight differences. Such a feature is also found in tonal repertoire and is often considered an obstacle to memorisation (Chaffin et al., 2002, 2010b).

Finally, one challenge in particular faced by one pianist in Study 3 was the difficulty in developing auditory memory in Berio's *Leaf*. This could have been related to the absence of familiar patterns and sounds, but also to a particular effect created by Luciano Berio to hinder aural perception, which consists of using the sustained pedal to create new harmonic and rhythmic layers that are not actually written in the score. Future research would be needed to further investigate this issue.

7.3 RQ3. WHICH LEARNING AND MEMORISATION STRATEGIES DO SKILLED MUSICIANS USE WHEN PREPARING NON-TONAL MUSIC FOR MEMORISED PERFORMANCE?

There is a large body of research exploring professional musicians' memorisation strategies (see Chapter 1, pp. 44-51 for a review), but only a limited number of studies examining specific techniques for non-tonal repertoire (Chueke & Chaffin, 2016; Li, 2007; Soares, 2015; Tsintzou & Theodorakis, 2008). The three studies in this thesis explored such techniques through interviews and observational studies with concert soloists and musicians early in their careers. The multiplicity of compositional methods employed in contemporary piano repertoire resulted in a varied use of memorisation strategies, depending on the nature of the music and on the pianists' learning styles. Nevertheless, some common approaches emerged.

Given the high level of complexity of the musical language in non-tonal piano repertoire, all pianists in Study 1 reported using a segmented approach to practice, focusing on very short segments (e.g., single bars). The pianists in Studies 2 and 3 used the same method. Most musicians dealt with complexity by using a divide-and-conquer strategy by dividing a problem into subproblems and conquering them individually (Riley & Hunt, 2014). Previous research on memorisation of non-tonal music has found similar practices (Soares, 2015; Tsintzou & Theodorakis, 2008). Actually, the use of segmented approaches appears to be favoured by skilled musicians in several styles of repertoire (Chaffin et al., 2002; Ginsborg, 2002; Gruson, 1988; Nielsen, 1999; Williamon & Valentine, 2002). As suggested in previous studies, this may depend on the nature of the task, because holistic approaches may work with short and simple pieces (Hallam, 1997; Mishra, 2011). In study 3, the piece was very short but not simple and, therefore, the pianists still felt the need to segment the music.

Findings from Studies 1 to 3 suggest that musicians use visual representation of the score and their own understanding of musical structure as the main criteria to organise practice. Most pianists in Study 1 reported relying on systems and pages of the score to segment very complex non-tonal pieces. The musicians in Studies 2 and 3 also used this criterion at some point in the learning process. Soares (2015) had previously reported this criterion for segmentation of non-tonal piano repertoire, but this thesis is the first to provide behavioural evidence that musicians actually use

systems and pages of the score to structure practice. Previous observational studies on memorisation of tonal music have mainly focused on the role of musical structure to organise practice and have neglected the role of score layout (Chaffin & Imreh, 2002; Chaffin et al., 2010; Williamon & Valentine, 2002). The author and two pianists in study 3 also used their subjective division of the piece into sections and subsections as criteria to organise practice. Because this is directly related to hierarchical components of retrieval schemes, these findings will be further discussed below (see Section 7.4).

The use of deliberate or incidental memorisation differed between the pianists examined in this thesis. In Study 1, some pianists reported using a deliberate approach to memorisation, while others prefer to let memorisation develop naturally over the course of learning. Even though non-tonal music is usually considered more difficult to memorise (Mishra, 2005; Oura & Hatano, 1988), some pianists reported developing memorisation incidentally in this repertoire, but usually after spending a long time with the piece. In Studies 2 and 3, all pianists engaged in deliberate memorisation at some point. The author and two of the pianists in Study 3 memorised deliberately, but one of the pianists in Study 3 had relied on incidental memorisation before this study. However, he used a different approach with Berio's *Leaf*, memorising from very early stages of learning. This appeared to have been a consequence of the nature of the research study, because the goal was to commit the music to memory. Moreover, the pianist reported difficulties in developing auditory memory of the piece. He also struggled with finding enough time to work on the piece. It is worth noting that one pianist in Study 1 who reported memorising Boulez's *Second Sonata* spent a total of three years working on the music. Time appears to be an important factor in the ability to develop incidental memorisation for this repertoire, but future research should investigate this issue further.

One technique constantly addressed in all studies of this thesis was practice away from the piano. Several pianists in Study 1 reported the benefits of using this practice in relation to memorisation, considering musical analysis or different forms of mental imagery as powerful tools for this type repertoire. The longitudinal case studies in this thesis were the first to consider mental rehearsal as an important part of the learning process and to give total freedom to the participants to practice away from the piano. In previous observational studies, musicians were often asked to

focus on physical rehearsal (Chaffin et al., 2010; Chaffin & Imreh, 2002; Ginsborg & Chaffin, 2011; Williamon & Valentine, 2002)

All of pianists in Studies 2 and 3 reinforced physical practice with mental imagery rehearsal. The author and two pianists used musical analysis in the first stages of learning. Two pianists in Study 3 actually combined notational analysis with listening to recordings. Musical analysis has long been recommended as an important tool in the literature on musical memorisation (Aiello & Williamon, 2002; Ginsborg, 2004; S. Hallam, 1997; Rubin-Rabson, 1937) and also appears to be very useful for non-tonal repertoire. In Study 3, pianists also practised away from the piano to prepare the score for physical practice, to decode complex rhythms, and to aid memorisation (by singing elements that were being used as memory cues and by engaging in aural and visual imagery). Although findings from this thesis strongly suggest that mental imagery rehearsal can be a useful memorisation technique for this type of repertoire, given the limited sample size and small number of pieces addressed, it is important to investigate this issue further in future research (see below, section 7.7).

Another technique identified in Studies 1 to 3 was the establishment of localised cues of different types to aid memorisation of specific musical elements. Some of these cues were chunks identified in the music (see section 7.4.1, p. 318 for further discussion about chunking strategies), either conceptual patterns or grouping pitches into hand shapes. Others were based on fundamental elements of the music (specific notes, rhythms, melodic contour, contrapuntal motion). Some pianists focused on conceptual representation of those elements, while others focused on the resulting sound or even on their visual representation on the keyboard. Soares (2015) has previously advocated the importance of combining varied types of cues to aid memorisation of this repertoire. For example, he proposed the use of *sonic-resonance cueing*, which consists of combining sound perception of musical elements with visual and kinaesthetic cues. In the studies of this thesis, some localised cues were used at certain points during deliberate memorisation and stopped being mentioned afterwards, while others remained a focus of attention and were thought about during performance, appearing to have become PCs (see section 7.4.2, p. 320 for further discussion).

The use of visual, auditory and kinaesthetic cues reported in all studies suggests once more that musicians rely on different types of memory while encoding and

retrieving music, as is often advocated in the literature in this field (Aiello & Williamon, 2002; Ginsborg, 2004). Findings from this thesis suggest that kinaesthetic memory has a crucial role in this type of repertoire. Some pianists in Study 1 reported that this memory is developed not only on the pianists' hands, but is actually mapped into the entire body, because this music often involves physically brutal actions and unconventional gestures. In Study 2, the author reported feeling that while working on a piece using extended techniques. As in previous literature, results from this thesis suggest that rote memorisation (solely based on incidental development of kinaesthetic and auditory memory) is not enough. One of the pianists in study 3 mainly relied on rote memorisation and did not succeed. The successful memorisers in Studies 2 and 3 combined rote memorisation with the development of a conceptual retrieval scheme, a strategy discussed below.

7.4 RQ4: HOW DO THE PRINCIPLES OF EXPERT MEMORY APPLY TO MEMORISATION OF NON-TONAL MUSIC?

As mentioned above, non-tonal piano pieces can be very demanding for pianists, cognitively and physically. Therefore, this repertoire is often performed by musicians with the highest levels of skill. A body of research on music memorisation has examined how skilled musicians memorise and has found that they use principles similar to those of experts in other domains (Chaffin et al., 2002; Chaffin & Logan, 2006; Williamon & Egner, 2004; Williamon & Valentine, 2002). PC theory, an account of expert memory in music, supports this premise (Chaffin et al., 2002; Ginsborg et al., 2012; Ginsborg & Chaffin, 2011). It argues that skilled musicians follow three principles of expert memory while memorising music. First, they use their stored knowledge of tonal music to chunk the new information into meaningful units. Second, they combine serial cueing with the development of a retrieval structure organised around a hierarchical framework (usually the musicians' interpretation of the formal structure) and comprising different types of PCs. Finally, musicians engage in prolonged practice of these retrieval structures to ensure rapid retrieval from LTM (Chaffin et al., 2002; Chaffin & Logan, 2006).

The evidence supporting PC theory has been based on studies on memorisation of tonal music (Chaffin et al., 2010b, 2013; Chaffin & Imreh, 2002;

Chen, 2015; Noice et al., 2008), but this thesis questioned whether such principles apply to the memorisation of non-tonal repertoire. Soares (2015) and Chaffin & Chueke (2016) were the first to examine the development of retrieval schemes in non-tonal piano music, and suggested that principles of PC theory also apply in this context. Nevertheless, their longitudinal case studies focused on short excerpts of non-tonal pieces. This thesis extended these results to entire non-tonal pieces as well as to different pianists, and has provided strong evidence that the three principles of expert memory mentioned above apply to the memorisation of non-tonal repertoire. Each principle will be now discussed in light of findings from the three main studies in this thesis.

7.4.1 RQ 4a: Do Pianists Engage In Meaningful Encoding of Musical Material Even When Tonal Language is Absent?

Previous research has argued that expert musicians are able to encode music more rapidly and effectively than novices because they can associate new musical information to ready-made chunks (e.g., chords, scales, arpeggios, phrases, or harmonic progressions), stored in LTM after years of training (Chaffin & Logan, 2006; Halpern & Bower, 1982). As stated in section 7.2, one challenge identified by pianists in non-tonal piano repertoire is precisely the absence of these ready-made chunks, often obscured or absent in this music. In this case, can musicians still chunk non-tonal music information into meaningful units? Based on the findings of this thesis, the answer to this question appears to be affirmative.

Some professional pianists in Study 1 reported using the chunking strategy as an aid to memorisation in different styles of contemporary piano music. Triantafillou described how he grouped the notes of a minimalist non-tonal piece into patterns. The pianist did not rely on conceptual chunks, but hand shapes. This strategy has been previously identified in literature as blocking and has been considered particularly useful for memorisation of tonal (Nellons, 1974) and non-tonal piano music (Soares, 2015). Theodorakis, who is also often commended for his extraordinary memory abilities (Dontas, 2004), reported using chunking whenever possible in a wide range of contemporary piano repertoire. The principles used by this pianist to organise

pitches depends on the composer and type of language found in the music. When the piece contains information related to tonal patterns, he groups the pitches based on his knowledge of tonal grammar. Such a strategy has been found in previous studies on memorisation of non-tonal music (Soares, 2015; Tsintzou & Theodorakis, 2008) and has been commended on pedagogic literature (Gordon, 2006, p. 84). If the music has no clear association to tonality, Theodorakis relies on compositional models employed by the composers, which he has became acquainted with after years of performing their music and through his practical experience as a composer. This account suggests that years of exposure to this repertoire results in long-term storage of non-tonal principles which can be readily used to encode this type of repertoire into larger units (Ericsson & Kintsch, 1995). Nevertheless, caution should be taken when making such an assumption, because this study was based on self-reports of one pianist, and future research should explore this issue further by using more robust methodological approaches. One interesting strategy used by Theodorakis to find chunking principles when pitches are too dispersed across the keyboard range is to condense them into one octave, as it facilitates the search for pitch relationships.

In Study 2, the author also attempted to memorise fast sequences of beats with the same notes arranged in slightly different orders by chunking them into patterns. These patterns were identified through recognition of specific intervals (e.g., chromatic or non-chromatic), which are also used in tonal music. The chunking of these sequences largely reduced the amount of material to be learned and became very important during the memorisation stage. Observation from practice behaviour provided evidence that these patterns were singled out for practice and were worked extensively during the learning process. Later, they were reported as PCs in memorised performance. Moreover, a written recall test conducted after nine months without any contact with the piece demonstrated that several patterns remained in LTM. This was the first longitudinal case study to provide robust evidence for the use of chunking by a skilled musician.

Finally, all pianists in Study 3 engaged in meaningful encoding of musical material in Berio's *Leaf*. Sophia spent a long time in the first stages of learning going through each chord and attempting to develop associations with tonal harmonies, or to understand their visual or sonorous components. Such connections were important not only during the first stages of encoding, but also during memorisation. Harry also associated some of the chords with tonal harmonies, mainly during the reading stage.

Emma did not attempt to connect the chords to her knowledge of tonal grammar but based her understanding on visual representations of hand shapes on the keyboard.

Several findings from this thesis have provided evidence that musicians engage in meaningful encoding of non-tonal musical material by combining their knowledge of the piece with general knowledge brought to the task (Chaffin et al., 2002; Mishra, 2005; Sloboda, 1985). This knowledge, either based on tonal musical grammar or on non-tonal music principles, can be used to recognise chunks in the musical material and help improve the effectiveness of the encoding and memorisation process. This principle has been advocated by recent research on expert memory investigating memorisation of randomised material (Sala & Gobet, 2017).

7.4.2 RQ 4b: How Do Pianists Develop Retrieval Schemes in This Context?

Theoretical accounts in this domain have also asserted that expert memory, regardless of the domain, requires the use of a retrieval scheme to organise cues to give access to chunks of information in long-term memory (Ericsson & Oliver, 1989). PC theory argues that retrieval cues developed by skilled musicians are related to features they pay attention to in the music during practice and are often organised around the formal structure of the piece (Chaffin & Imreh, 2002). Soares (2015) and Chueke and Chaffin (2016) were the first to provide evidence that musicians also develop hierarchical retrieval structures in non-tonal piano repertoire. They both suggest that the hierarchical organisation is based on musicians' personal understanding of musical structure and on different types of PCs. The current thesis validated these assumptions through a series of large-scale longitudinal case studies with two different non-tonal pieces, memorised by different pianists. Moreover, the in-depth exploration of memorisation of entire non-tonal pieces in studies 1 and 2 provided unique insights into the salient components of retrieval structures used in this context. These components will now be discussed in further detail.

7.4.3.1 RQ 4b (i): How are Retrieval Schemes Organised?

Studies 2 and 3 validate the PC theory claim that musicians develop retrieval schemes and organise them around the musical structure, even in the presence of more complex or obscures structural forms.

In Study 2, the author developed a hierarchical retrieval scheme for the piece *If You Were Here* organised around her idiosyncratic understanding of musical structure. The author was not able to find a ready-made structural framework, but she made a clear effort to identify an organisational basis to hold on to, based on intuitive perception of textures, musical elements or specific difficulties. The structure identified was used to meaningfully segment the piece for practice in combination with the visual layout of the score. Analysis of practice behaviour found that the structural boundaries identified and the systems and pages of the score served frequently as starting and stopping locations in practice throughout the learning process. The same locations were used as cues to monitor memorised performance and became landmarks in long-term memory, as indicated by a written recall test performed nine months without any contact with the piece. Soares's (2015) longitudinal case study on memorisation of Messiaen's music did not examine the role of structural landmarks in long-term recall, but results of a subsequent study examining a played recall test of Boulez's sixth *Notation* also suggested that structural boundaries served as landmarks for memory. Study 2 of the current thesis extended these findings and provided robust evidence from practice and recall that structural boundaries are used to monitor practice and performance and become landmarks in long-term memory.

Musical structure was also used as an organisational basis for retrieval schemes developed by two pianists in Study 3. Although these pianists thought of particular locations of the piece as structural, the locations selected differed significantly among the pianists and were not at all related to principles of composition employed by the composer. For example, no pianist in this study mentioned the twelve-tone row used by Luciano Berio in *Leaf.* Research on aural perception has previously suggested that these compositional devices are not useful prototypes in perception and memory (Imberty, 1993). Soares (2015), although able to recognise these rows in Boulez's music, didn't use them as main support for memorisation.

Even though idiosyncratic, the structure developed by the pianists in Studies 2 and 3 was still hierarchical, with small subsections incorporated into larger sections. Both types of boundaries were used as starting and stopping places during practice and thought about during memorised performance. This validates the assumption that musicians still organise their retrieval schemes hierarchically, even if not basing them on existing structural forms. One pianist in Study 3 stated that she could use those

locations as recovery points in case of memory failure, suggesting that these boundaries had become structural PCs. Another pianist in the same study attempted to find a structural meaning for the piece but was unable to do so. This pianist mainly relied on serial cueing and did not develop a retrieval scheme to allow him to recover in case of memory failure. This resulted in an inability to recover from a memory lapse in performance and, consequently, on a less successful memorised performance.

Findings from the longitudinal case studies suggest, once more, that even in the absence of common structural frameworks, it is helpful for musicians to think in structural terms and, therefore, engage in creative and subjective interpretations of musical structure. Such an approach can also be applied to other repertoires, including tonal music (Ginsborg, 2017; Williamon & Valentine, 2002). The importance of structure for the act of memorisation, as advocated by pedagogues and psychologists investigating this topic (Aiello & Williamon, 2002; Ginsborg, 2017), is once more confirmed in this thesis.

7.4.3.2 RQ 4b (ii): What Types of Retrieval Cues Are Developed?

Studies 2 and 3 also provided evidence that musicians develop PCs of different types to serve as landmarks during memorised performance. The unusual performance practices employed in *If You Were Here* resulted in the development of new types of basic PCs, namely extended techniques and positioning/body movement. Such PCs are related to the unconventional performance practices of this music, namely the performance of glissandos or harmonics on the strings, as well as the placement of strange objects on the soundboard. Evidence from practice behaviour and self-reports indicated that basic PCs were a focus of attention and practised extensively throughout all learning periods. Moreover, the written recall test indicated that basic PCs became landmarks in long-term memory of the piece. This was the first longitudinal case study contributing to PC theory reporting negative serial position effects for basic PCs. In previous studies, basic PCs mainly related to critical details of technique and were connected to important motor actions that could not be performed in a written recall test (Chaffin & Imreh, 2002, p. 348; Chaffin & Lisboa, 2008, p. 131). Although some basic PCs also related to critical details of technique, in this case many were based on information provided by the score (notes and rhythm), which served as labels for structural units, such as patterns. These chunks were

practised extensively to ensure proper coordination between motor actions and conceptual representation of the patterns. This may explain why they remained in LTM after almost one year and why they could be recalled accurately in a written recall test (as there was an effort to develop conceptual memory of these chunks). Expressive PCs only affected practice in the first learning period, but the written recall test suggested they also became landmarks in LTM, as found in previous studies (Chaffin et al., 2010; Chaffin & Imreh, 2002; Ginsborg & Chaffin, 2011). Although the difficulties of this piece led to a greater focus on basic issues, expressive features were very important in performance to help communicate the meaning of the music to the audience.

Study 3 also provided evidence for the use of different types of PCs by two pianists while memorising Berio's *Leaf*. Both pianists developed basic (e.g., notes, melodic contour, rhythm or hand shapes) and structural cues during practice and thought about them in performance. One of the pianists also reported thinking about an expressive cue. As stated above, analyses of practice behaviour provided evidence that both pianists started and stopped more at structural boundaries than other locations. In one specific case (Emma), there was also evidence that basic PCs were singled out for practice throughout the learning process. One pianist did not develop PCs, which resulted in a poor memorised performance.

All pianists in Studies 2 and 3 reported a lower number of interpretative and expressive PCs when compared to basic PCs. This result differs from previous longitudinal case studies (Chaffin et al., 2010; Chaffin & Imreh, 2002; Soares, 2015). The difference may be related to the unfamiliarity of the musicians with the musical language, requiring more attention to basic issues during learning and performance. Moreover, it can be associated with the musicians' interpretation of the piece. For example, in Study 3, some pianists did not consider Berio's *Leaf* expressive and narrative, but one of the pianists actually attempted to find expressive meaning in the music.

7.4.3.3 RQ 4b (iii): How Do Retrieval Structures Develop and Change as Musicians Learn Compositions for Performance?

Research into expert memory in music has provided insights into how retrieval structures develop and change as musicians prepare musical pieces for memorised

performance. Previous studies have suggested that musicians shift their focus of attention between higher and lower hierarchical levels of retrieval structures throughout the learning process (Chaffin & Logan, 2006; Williamon et al., 2002; Williamon, 1999a). PC theory proposes that, similarly to experts in other fields, musicians attend to the higher levels in the very first stages of learning, by first looking at the big picture of the piece (Chaffin et al., 2003; Chaffin & Logan, 2006; Glaser & Chi, 1988; Gobet & Simon, 1996). Mishra's (2005) model of music memorization also proposes that musicians will first preview the piece before engaging in detailed work.

In this thesis, all of the professional pianists interviewed in study 1 confirmed that this premise also applies to contemporary piano repertoire, acknowledging the importance of identifying task demands and understanding what is happening before approaching detailed work. However, one pianist also noted that in very complex pieces, it takes more time to see the artistic image than in tonal music, and one might have to figure out the big picture as practice progresses. This is exactly what happened to the author, in Study 2. Although there was an attempt to preview the piece and understand the artistic image at the beginning, the complex visual writing and the unfamiliarity with the extended techniques required time to be understood and put into practice. Consequently, the author gradually grasped the artistic form of the piece while doing detailed work on technique. Two pianists in Study 3 started with a preview of Berio's *Leaf* before engaging in detailed work by listening to existing recordings (aural preview) and analysing the score (notational overview). Soares (2015) reported similar approaches in his studies. One pianist did not preview the work and started working on details straight away. As stated above, this pianist's approach was unsystematic and mainly based on rote methods of memorisation, but was also not successful.

Williamon and Valentine (2002) claim that musicians shift attention between hierarchical levels of structure as they develop their retrieval schemes. Findings from Studies 2 and 3 confirm this assertion. The author in Study 2 alternated between subsections and sections boundaries, as well as between systems and pages of the visual layout of the score as practice progressed. In Study 3, Emma figured out the higher levels of structure in the first stages of learning, but did not use them to guide practice at first, relying on the score layout in the initial stages of learning. She started using musical structure to guide practice during deliberate memorisation,

using beginnings and ends of subsections as starting and stopping places. In the last period, she alternated between work on major sections and subsections. Sophia was not able to get a clear picture of structure from the start but, as shown by the analyses of practice behaviour, she intuitively started and stopped at locations later considered to be structural boundaries. While consolidating memory, she mainly focused on the lower levels of structure and only near the performance started interspersing between major sections and subsections, and systems and pages of the score.

Williamon (1999a) was the first to propose that musicians develop retrieval structures through a *zoom mechanism*, a metaphor previously used to describe cognitive processes related to processing of visual information (Kosslyn, 1975, 1976, 1980). By using such a mechanism, musicians shift focus between different levels of the hierarchical structure, interspersing short and long musical segments. The analysis of practice behaviour in Studies 2 and 3 confirm this assumption, as most musicians used this type of approach to organise their practice. Williamon's findings also suggest that musicians tend to first solve technical problems by focusing more on difficult bars and later on structural bars. This was not the case in Study 3, as Emma and Sophia also focused on difficult bars in the last stages of learning. The difference in results may be related to the level of technical difficulty of the pieces. As stated above, non-tonal pieces tend to incorporate a type of writing that is not always comfortable for pianists, which may require work and attention until the final learning stages.

7.4.3.4 RQ4b (iv) Do Musicians Engage in Extensive Practice of Those Structures?

Existing theories of expert memory state that retrieval of conceptual knowledge from LTM takes time and needs work in order to increase the speed of retrieval of the information stored (Ericsson & Kintsch, 1995). PC theory claims that the same principle applies to professional musicians, because they need to ensure retrieval from conceptual memory will follow at the same pace in performance as retrieval from motor LTM (Chaffin et al., 2002, p. 199). Findings from Studies 2 and 3 validate this assumption. The author, in Study 2, spent 57.66 hours practising *If You Were Here* until she was able to perform with high confidence from memory. She dedicated 13 hours of deliberate focus on memorisation during the second learning

period and continued to engage in memory consolidation afterwards. This is not surprising, given the long duration of the piece and the highly technical difficulties and unconventional performance practices. The author spent a long time practising chunks found in the piece and ensuring proper coordination between her thoughts about the patterns and the finger movements used to perform them. The same applied to several cues that later became PCs. In Study 3, the pianists who were able to memorise Berio's *Leaf* successfully took time to ensure that conceptual cues developed during learning to aid memorisation would be coordinated with finger actions. All pianists in Studies 2 and 3 used verbalisation to help coordinate thoughts about cues with motor action during practice. Because their piece was very short (around one minute long), the pianists in Study 3 took less time to memorise Berio's *Leaf* (ranging between five and fifteen hours of practice) than did the author, in Study 2. Nevertheless, this is still a large number of hours to devote to the memorisation of such a short piece. Once again, findings from longitudinal case studies in this thesis validate the principle of extended practice of retrieval schemes, as advocated by PC theory and accounts of expert memory in other domains (Gobet, 2015).

In summary, the answers to research question 4 strongly demonstrate that findings from this thesis validate the assumption that principles of expert memory also apply to memorisation of non-tonal repertoire.

7.5 PRACTICAL APPLICATIONS

Findings from this thesis have practical applications highly valuable for performers and pedagogues interested in improving ability to learn and memorise non-tonal piano repertoire. As addressed in Study 1, pianists' training is mainly based on tonal styles of repertoire and they usually have little or no educational support in relation to learning or memorisation techniques for non-tonal repertoire (Thomas, 1999). Several learning and memorisation techniques emerging in the findings of this thesis can be used by musicians to cope with the demands of music that challenges standard tonal rules, and will be described below:

- When dealing with a large amount of new and unfamiliar information, musicians can chunk the information into meaningful patterns. Chunking in non-tonal music can be achieved by relating the new information to tonal

patterns, or by relying on principles of composition used by the composer. If conceptual principles cannot be found, one possible strategy is to group the pitches into hand shapes or a topography of the keyboard. If pitches are too dispersed and the patterns become difficult to find, pianists can condense the passage within the range of one octave and look for specific relationships. The varied encoding of chunks through visual, kinaesthetic, aural and conceptual cues can reinforce their storage in LTM.

- When working on large and complex non-tonal pieces, pianists can cope with complexity by dividing the music into very small segments and working on conquering each small problem individually. Ideally, the musician should practise segments consistently and use specific locations in the piece as starting places, in order to develop a safety net for the performance that allows them to start from different places in the composition, as recommended by PC theory.
- Although non-tonal music has less conventional or even non-existent formal structures, it can still be helpful to think in structural terms by finding a subjective organisation for the piece. When structural meaning for the piece seems impossible to find, musicians can also rely on the visual layout of the score as one criterium to segment practice. Rhythmic structure and the set of gestures used to embody the music can also help give meaning to the piece.
- Combinations of physical practice with mental imagery rehearsal appear to be a useful aid to memorisation. Practice on the keyboard can be combined with musical analyses and different types of mental imagery (visual, auditory, kinaesthetic).
- Sometimes problematic writing and unfamiliar sounds may hinder proper development of kinaesthetic and aural memory in non-tonal repertoire. One possible strategy is to rewrite the piano part to better connect the notation to the actions performed on the keyboard. Another strategy also proposed in previous literature is to combine different types of memory (kinaesthetic, visual, aural, conceptual).
- Findings from this thesis highlighted once more the importance of developing conceptual memory, namely a mental map with landmarks to guide memorised performance, which allows musicians to recover in case of

memory failure. These landmarks can be music features paid attention to during practice that can later be thought about in performance and trigger memory retrieval of that specific location. Although PC theory has long advocated the importance of this strategy for effective memorisation, there is still a large amount of work to be done to disseminate these findings in pedagogical institutions and to encourage teachers to help provide students with effective tools to develop secure memorisation.

The combination of the current findings with the findings of previous research presents a strong case for the beneficial use of these memorisation strategies to aid effectiveness of encoding and retrieval of musical information. Although musical memorisation has received a great deal of attention among researchers, this issue is still often neglected and generally lacking in performance training and education. The case of non-tonal repertoire is even more problematic, as the most common solution at the moment is to perform with the score. As pointed out throughout this thesis, some pianists still prefer to perform this music from memory or, in some pieces, the removal of the piano stand and the constant need to move around the instrument difficult a proper look at the score. Even if the music is used on stage, pianists still need to look at their hands or at different parts of the piano. Therefore, they could benefit from using these memorisation techniques to feel secure while performing without looking at the score. Finally, several strategies emerging in this thesis are not specific to memorisation, but can be very useful for musicians' practice of this repertoire.

7.6 LIMITATIONS OF THIS RESEARCH

As with any research examining memorisation in musical performance, this thesis presents limitations that should be acknowledged. Study 1 focused on a convenience sample in order to collect reports from professional pianists with specialised knowledge of this repertoire and with different viewpoints about the practice of performing from memory. The number of participants was small, in order to be able to explore their subjective experiences in greater depth. Consequently, the results cannot be generalised and are solely based on self-reports. Studies 2 and 3 aimed to

address this limitation by combining analyses of musicians' self-reports with behavioural evidence. Nevertheless, the choice of preserving ecological validity and exploring the learning process in as much depth as possible resulted in the observation of a small number of participants memorising two non-tonal compositions. Therefore, generalisations relating to other musicians and other types of non-tonal repertoire must be made with care. Nevertheless, triangulation of different types of data emerging in the studies and in previous research (Soares, 2015; Tsintzou & Theodorakis, 2008) found similarities among musicians' approaches to very different styles of non-tonal piano music, suggesting that some strategies can be applicable to other musicians and other non-tonal compositions.

The three studies in this thesis reported memorisation approaches by pianists in early and mid-careers, but there was no comparative analysis of musicians of different skill levels. The insights from this thesis can be further extended in the future by observational studies with larger samples, comparing the approaches of musicians of different levels of expertise.

The selected statistical model was multiple-regression analysis, which has also been employed in earlier longitudinal case studies of PC theory (Chaffin et al., 2010b, 2013; Chaffin & Imreh, 2002). Although this allowed direct comparison with previous findings, it is important to acknowledge that this type of statistical model assumes independence across different observations. In this case, observations cannot be considered independent because they examined time-series data and musical compositions whose hierarchical levels have dependent relationships. This limitation will be further addressed in future publications planned in collaboration with researchers Roger Chaffin and Alexander Demos, by exploring the behavioural data through generalised mixed-effects models, as in more recent longitudinal case studies (Ginsborg & Chaffin, 2011; Lisboa et al., 2015).

7.7 CONCLUSIONS AND AVENUES FOR FURTHER RESEARCH

The present thesis has provided novel insights into the cognitive mechanisms governing the encoding and retrieval of musical information that does not follow tonal rules of composition. Findings from these studies strongly suggest that principles of expert memory apply to memorisation of non-tonal repertoire. The study

completed by the author was the first to provide robust evidence (combination of self-reports and behavioural data) for the use of chunking in musical memorisation of complete compositions. Studies 2 and 3 corroborated assumptions from PC theory, confirming that musicians can develop retrieval schemes while memorising non-tonal compositions. Both studies provided evidence that those schemes still follow hierarchical principles of organisation, as most musicians organise their schemes around personal understanding of musical structure. Nevertheless, because the music often moves away from well-known formal structures, musicians do not have a ready-made framework to hold on to from the start, as has been previously advocated by PC theory (Chaffin & Logan, 2006). Therefore, they engage in creative ways of finding organisational principles for the music. For some musicians or some specific pieces, the discovery of the big picture may take longer and can gradually occur as practice progresses. When and while structural meaning is not found, the visual layout can be a possible option to organise practice.

Findings from this thesis also offered unique insights into the types of PCs used in this context. Study 2 found new PCs used for music for prepared piano, based on unconventional extended techniques. This was also the first longitudinal case study contributing to PC theory reporting that basic PCs became landmarks in the musician's LTM. Study 3 provided one of the few existing comparisons of PCs developed by different musicians for the same piece. Moreover, it offered the opportunity to compare the ways in which different musicians segment the same non-tonal piece for practice, revealing a high diversity in this case.

All of the studies in this thesis provided important insights into the type of learning and memorisation strategies employed in this repertoire. These findings suggest that a divide-and-conquer strategy is an effective approach when dealing with very complex and unfamiliar music. Moreover, a combination of physical and mental rehearsal can also be used as an aid for memorisation of non-tonal music. Specific strategies, such as the rewriting of passages for clarity and simplicity, as well chunking techniques based on associations with tonal patterns or visual cues (e.g., hand shapes or piano topography) appear to be particularly useful for this repertoire. Finally, the deliberate establishment of localised cues of different types, which trigger the use of different types of memory (kinaesthetic, auditory, visual and conceptual), can complement the development of serial cueing.

Future research could further explore the findings emerging from this thesis. Subsequent studies could examine the role of performers' understanding of musical structure and of different types of PCs in the development of hierarchical retrieval schemes for non-tonal repertoire on other instruments. Moreover, the individual-specific segmentations used to encode tonal and non-tonal music could be further examined with larger samples in order to extend the understanding of how musicians' knowledge is organised and stored. The role of personal structural understanding and of visual representation of score layout can be further examined and compared in relation to tonal and non-tonal repertoire. Studies on expert memory could further explore the use of chunking in this type of repertoire by examining its effectiveness in experiments in the laboratory, within controlled conditions and with larger samples. Research on recall could also further examine whether distinct elements in this repertoire, such as unconventional extended techniques, will be easier to remember than others, as suggested in study 2. With regard to specific memorisation strategies, the role of mental rehearsal imagery in this particular context also needs further examination. Subsequent studies could also explore why the tradition of performing from memory is losing strength in contemporary piano repertoire, and examine in greater depth the views of musicians towards this topic, as this thesis found that several pianists still see benefits in memorising this music. A new avenue for further research could also explore examination of the potential of these strategies in pedagogical contexts.

This thesis breaks new ground of knowledge, providing an important contribution to a body of research that is still highly based on memorisation of tonal repertoire, and has provided unique insights into how musicians encode and retrieve musical information that does not follow well-known principles of composition, standard formal structures or conventional performance practices.

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APPENDIX 1: INTERVIEW TOPIC GUIDE STUDY 1

Structure	Domains	Questions	Probes/prompts
Introduction		Brief introduction of myself and the project Ask to record Ask for any questions	
Warm-up		Introduce what I know about the pianists and the repertoire they usually play. Ask for more information. What composers do you usually include in your programmes? In the case of contemporary music, do you have any preference for specific styles or composers?	Can you tell me more?
Main Domains	Attitudes towards performing from memory	Do you play your repertoire from memory? What styles of repertoire do you play from memory? Can you identify advantages and disadvantages of performing from memory?	Why? Why not? All of it?
	Experiences of learning and memorising	What aspects do you focus on: • When learning a piece? • When memorising a piece? In what stage of learning the piece do you start memorising? Can you describe, in as much detail as possible, your process of memorisation? Is your process of learning/memorisation of contemporary music different from other styles of repertoire? If you decide to perform with the score, how do you prepare the performance?	Ask for examples of specific pieces Ask for different styles Ask particularly about contemporary
	Experiences of performing	When you are performing from memory what do you think?	What do you feel? What do you focus on?

	from memory		
		Have you had memory slips in performance?	
	Skills required to perform contemporary music	What skills do you think a performer should have to be able to prepare and perform contemporary music?	Why?
		How do pianists acquire those skills?	
		Do you think our educational background prepares us to have those skills?	
	Particular experiences in contemporary music	Do you have close collaborations with composers?	Can you describe those collaborations?
		Have you commissioned new works to living composers?	Can you give me more detail?
		In what ways do you think the collaboration between composer and performer would influence the way you practice and approach the work?	Why?
		Do you compose?	
		In what ways do you think composing relates to your approach to practice? And memorisation?	
Closing		Do you have any other issue you would like to discuss?	
		Did you have difficulties understanding the questions?	
		Is there anything you would like to change or add?	
		Thank you very much for your collaboration	

APPENDIX 2: INTERVIEW TOPIC GUIDES STUDY 3

APPENDIX 2.1: FIRST INTERVIEW

Structure	Domains	Questions	Probes/prompts
Introduction		Brief introduction of myself and the project. Ask permission to record Ask if participants have any questions	
Warm-up		Can you talk about your background as a musician? When did you start learning piano? Do you play other instruments? Can you talk about the repertoire you have been playing?	Where did you study?
Main Domains	Attitudes towards performing from memory	Do you play your repertoire from memory? What styles of repertoire do you play from memory? Can you identify advantages and disadvantages of performing from memory?	Why? Why not? All of it?
	Experiences of learning, memorising and performing from memory	What aspects do you focus on: • When learning a piece? • When memorising a piece? • In what stages of learning the piece do you start memorising? Can you describe, in as much detail as possible, your process of memorisation? Do you use different specific memorisation strategies for different styles?	Ask for examples of specific pieces Ask for different styles
	Experiences during performances	When you are performing from memory what do you think? Have you had memory slips in performance?	What do you feel? What do you focus on?
	Skills required to	What skills do you think a	Why?

	perform contemporary music	performer should have to be able to prepare and perform contemporary music?	
		How do pianists acquire those skills?	
		Do you think our educational background prepares us to have those skills?	
	Particular experiences in contemporary music	Have you worked with living composers?	Can you give me more detail?
		In what ways do you think the collaboration between composer and performer would influence the way you practice and approach the work?	Why?
Closing		Do you have any other issue you would like to discuss?	
		Did you have difficulties understanding the questions?	
		Is there anything you would like to change or add?	
		Thank you very much for your collaboration in this study	

APPENDIX 2.2. FINAL INTERVIEW

Structure	Domains	Questions	Probes/prompts
Introduction		Thank participants for their participation in this research project. Ask permission to record. Ask whether they have any questions	
Main Domains	Thoughts during performance	You just finished performing the piece. Can you tell me what you were thinking about and focusing on during performance?	What aspects were you paying attention to? Why? Why were you focusing on these places?
		Can you explain me what you have reported on the new score? (with a copy of the score where pianists have wrote down what they were thinking about and the musical features they were focusing on during performance)	Did it help?
		Did you have any memory slip?	Where?
	Practice	Can you describe how did you practice the piece?	Can you give me more detail? Why?
		What strategies did you use to practice this piece?	Did you use the same strategies as in other pieces you learned before?
	Memorisation	Can you tell me about your experience of memorising the piece?	Can you give me more detail? Why?
		In what stage of learning did you start memorising the piece?	
		What strategies did you use?	
		What type of memories did you use?	
Closing		Do you have any other issue you would like to discuss?	

	Is there anything you would like to change or add? Thank the participants for their participation and hard work in the study.

APPENDIX 3. PROTOCOL STUDY 3

Pianists learning and memorising a non-tonal piano piece: an observational study

Instructions

1. **Video-recordings and comments to the video camera**

All practice sessions dedicated to learning and memorising of Luciano Berio's *Leaf* should be video recorded. Different types of video cameras can be used (your phone, ipad, photographic cameras, video cameras, etc.). If you don't have any camera available let us know and we will provide one. The camera should be placed in a position that allows visibility of the keyboard and the score. While you practice, whenever possible, think out loud and comment to the camera on what you are doing (e.g., describe your goals for that session, the musical and technical decisions you are making and the practice and memorisation strategies you are using). Please, whenever possible confirm if you are playing from memory or looking at the score. If you want to engage into mental practice, ideally you should do it in front of the camera and comment on your goals and strategies used, or write down in a diary the amount of mental practice made and what you were doing at that moment (goals and strategies).

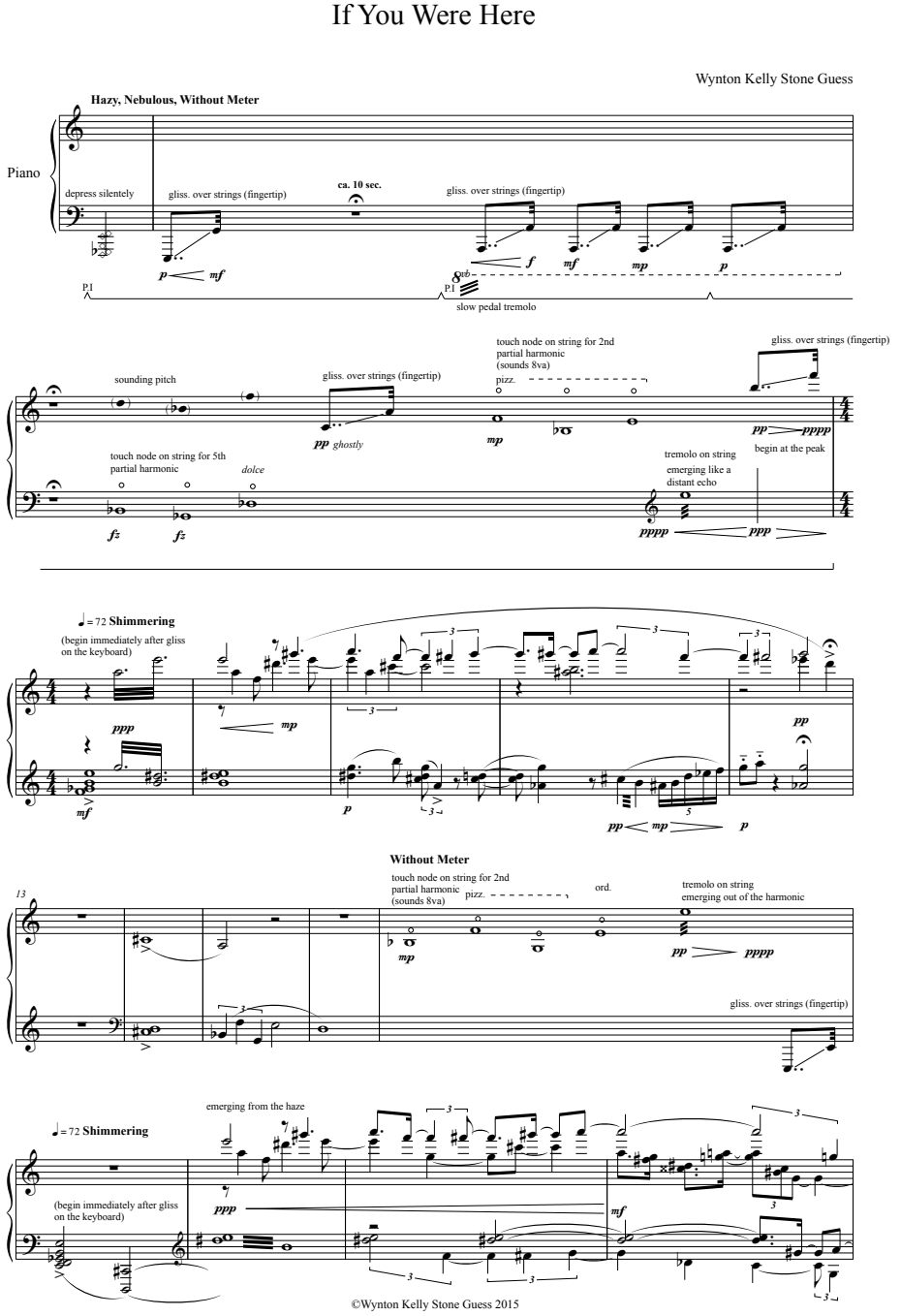
2. **Copies of the score**

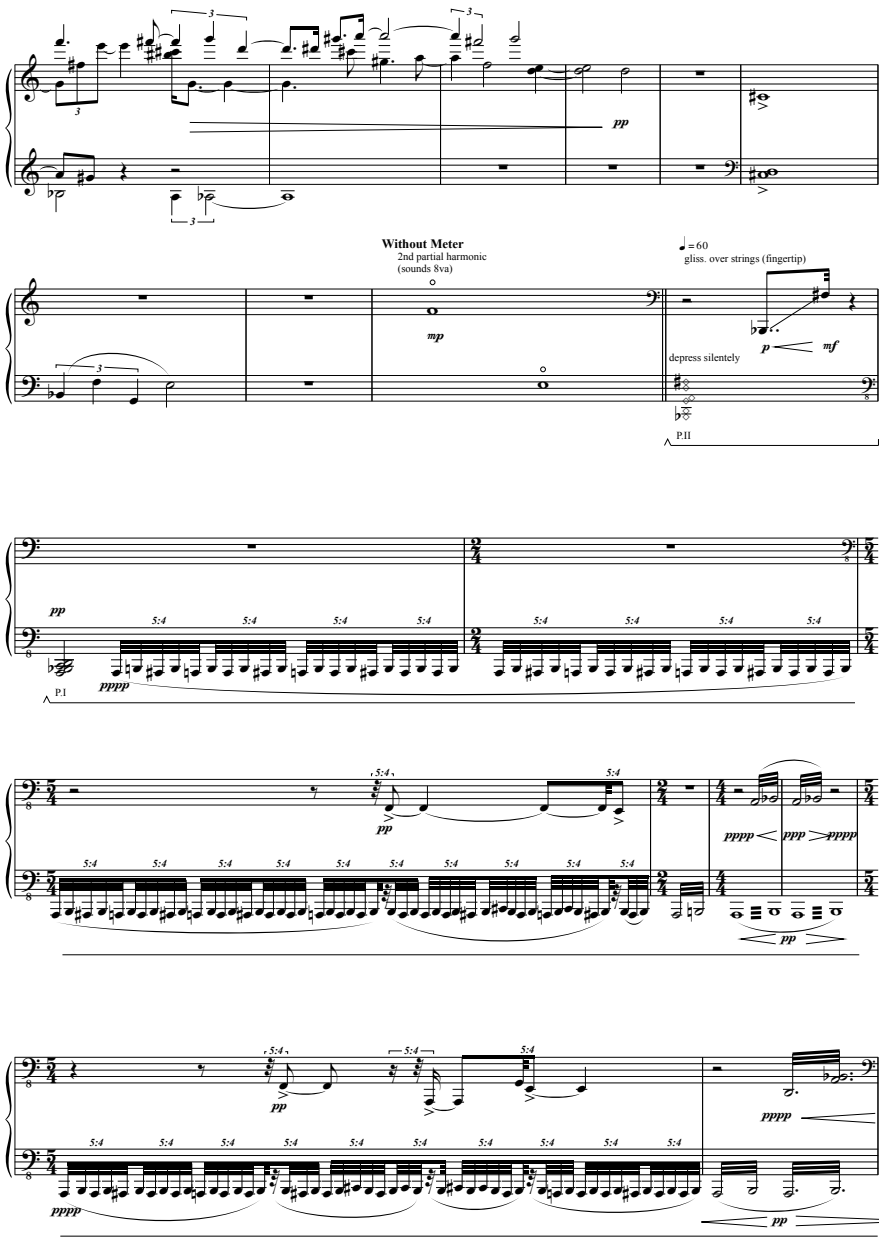
You will receive different copies of the score while you are learning the piece. You should annotate on those scores the musical and technical decisions you are making (e.g on fingering, pedaling, dynamics, articulation, sectional boundaries, etc.) and the aspects of the music you are paying attention to. After the performance you will receive a new score in which you should highlight the places and aspects you were focusing on while performing.

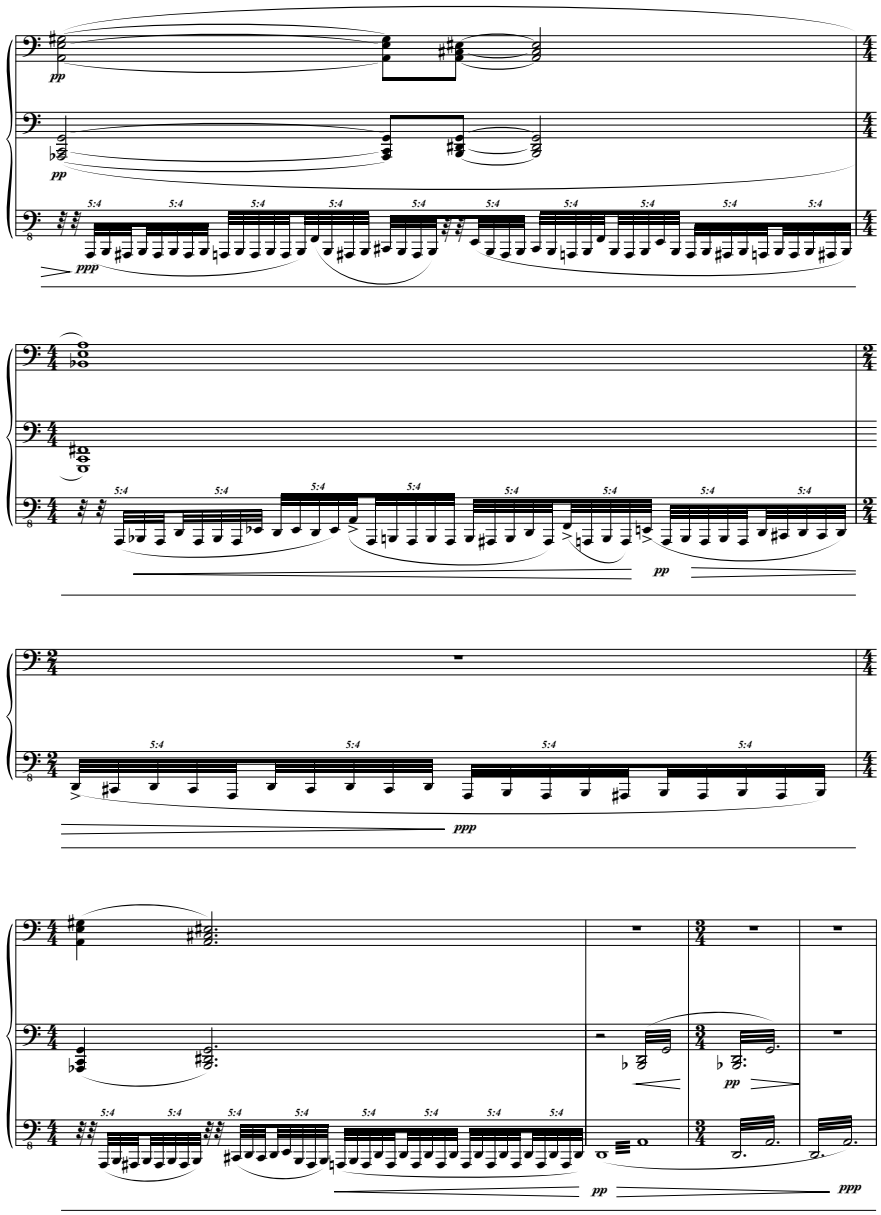
3. Performance

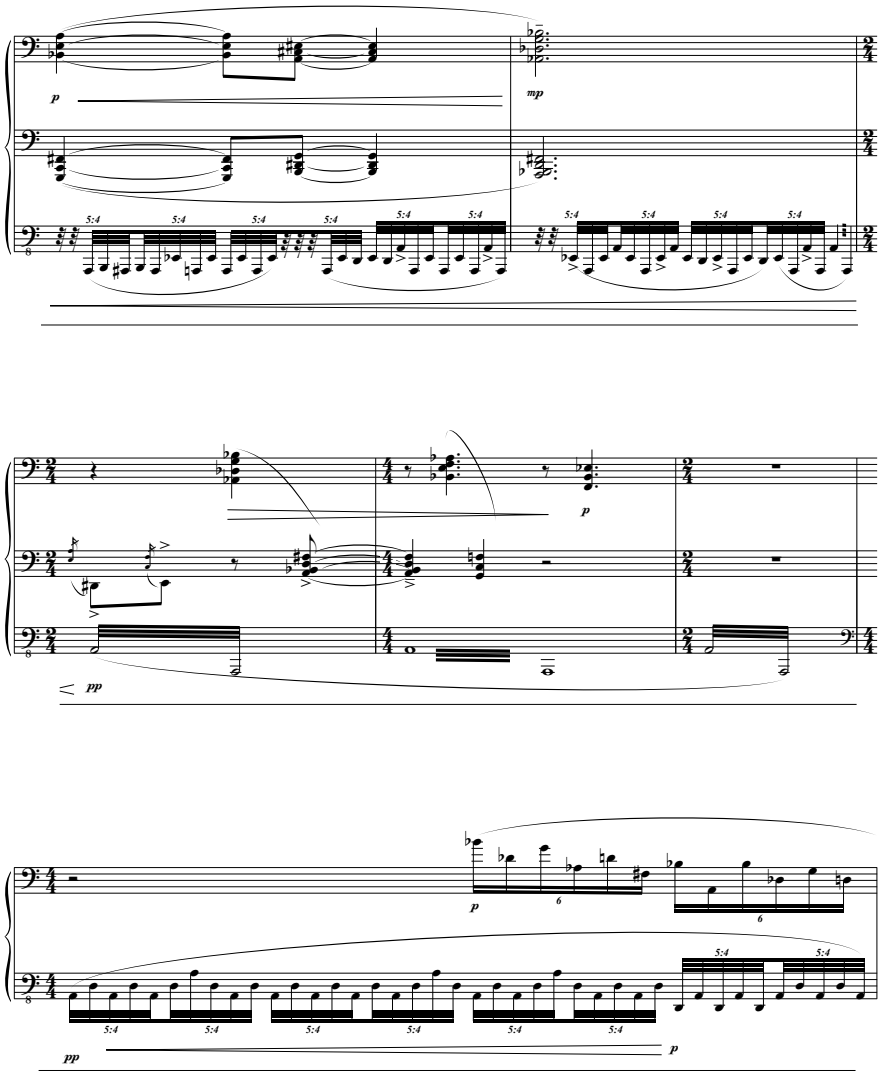
You will be asked to perform the piece from memory (around one month and a half after you start practising). The performance will be video-recorded. After finishing performing you will be given a new score to write down everything you were focusing on during performance. Finally, you will be interviewed about your experiences of practising, memorising and performing the piece throughout the study.

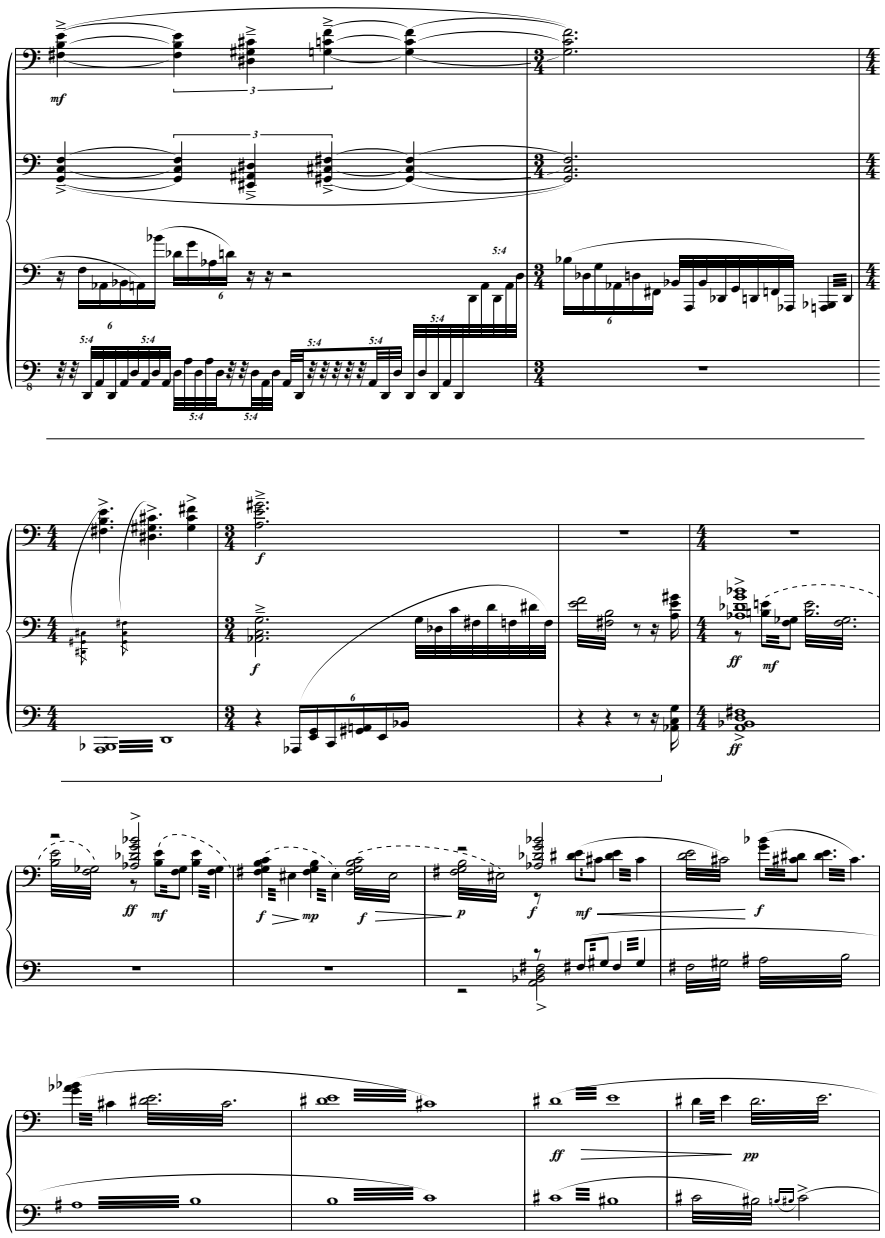
APPENDIX 4: PIECE PERFORMED IN STUDY 2

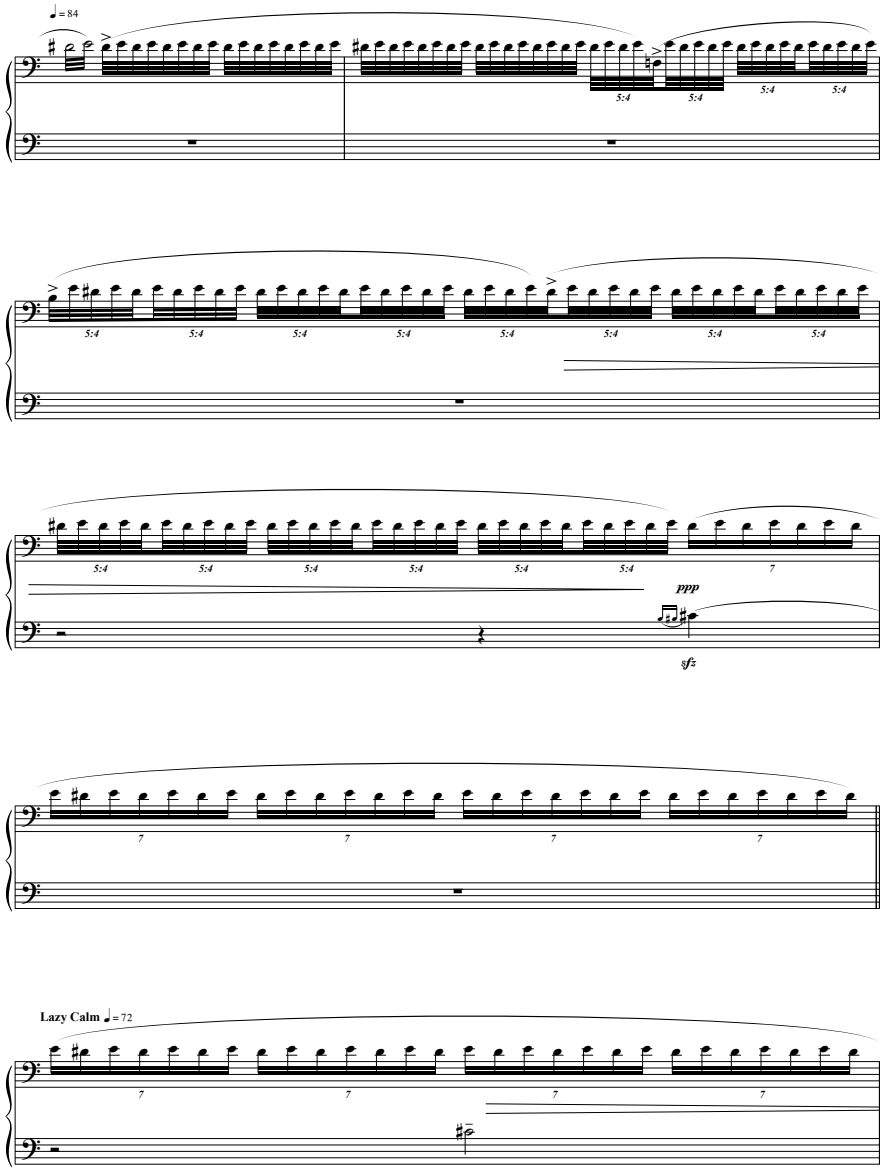


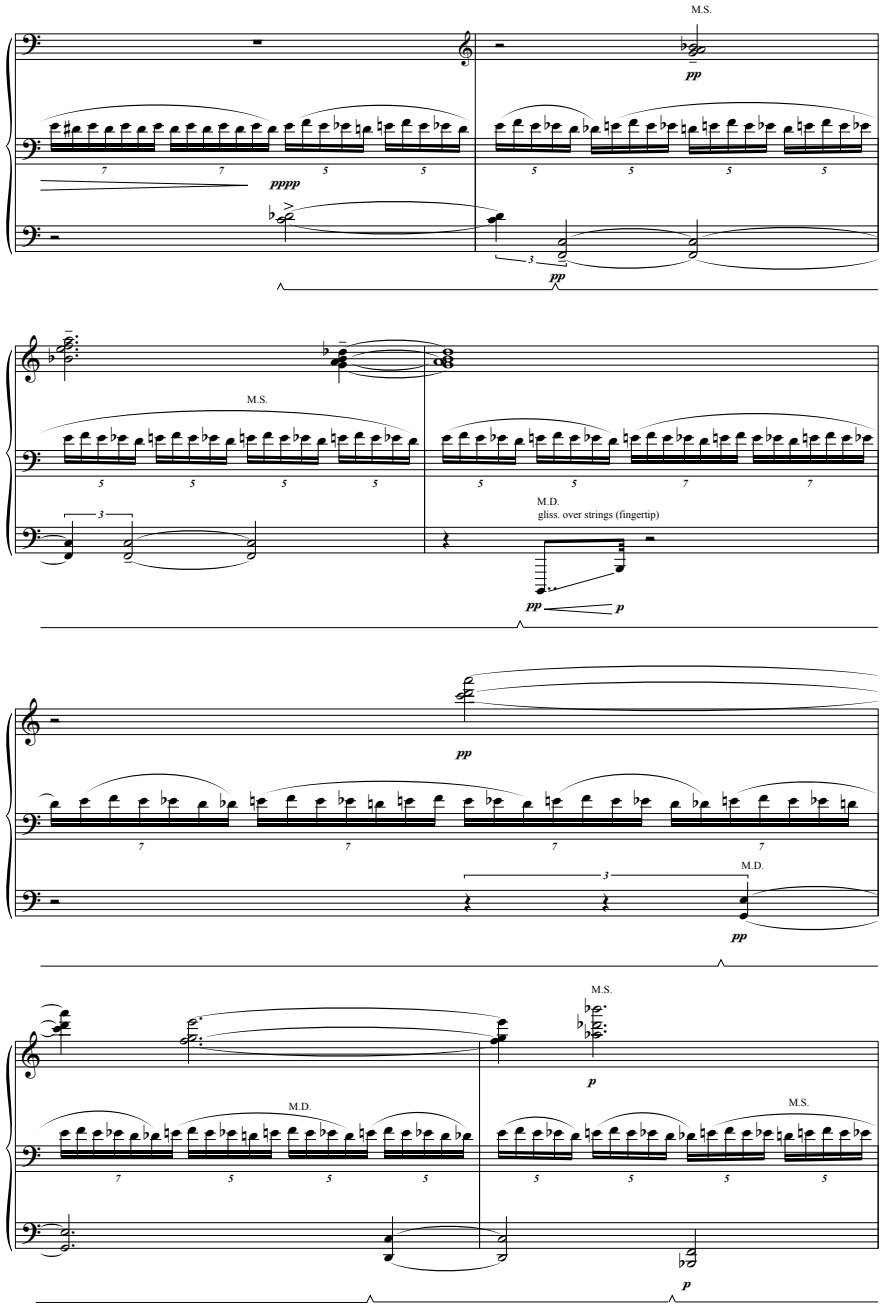

pp
Without Meter
2nd partial harmonic
(sounds 8va)
mp
= 60
gliss. over strings (fingertip)
p
mf
depress silently
P.II
P.I
pppp
ppp
5:4

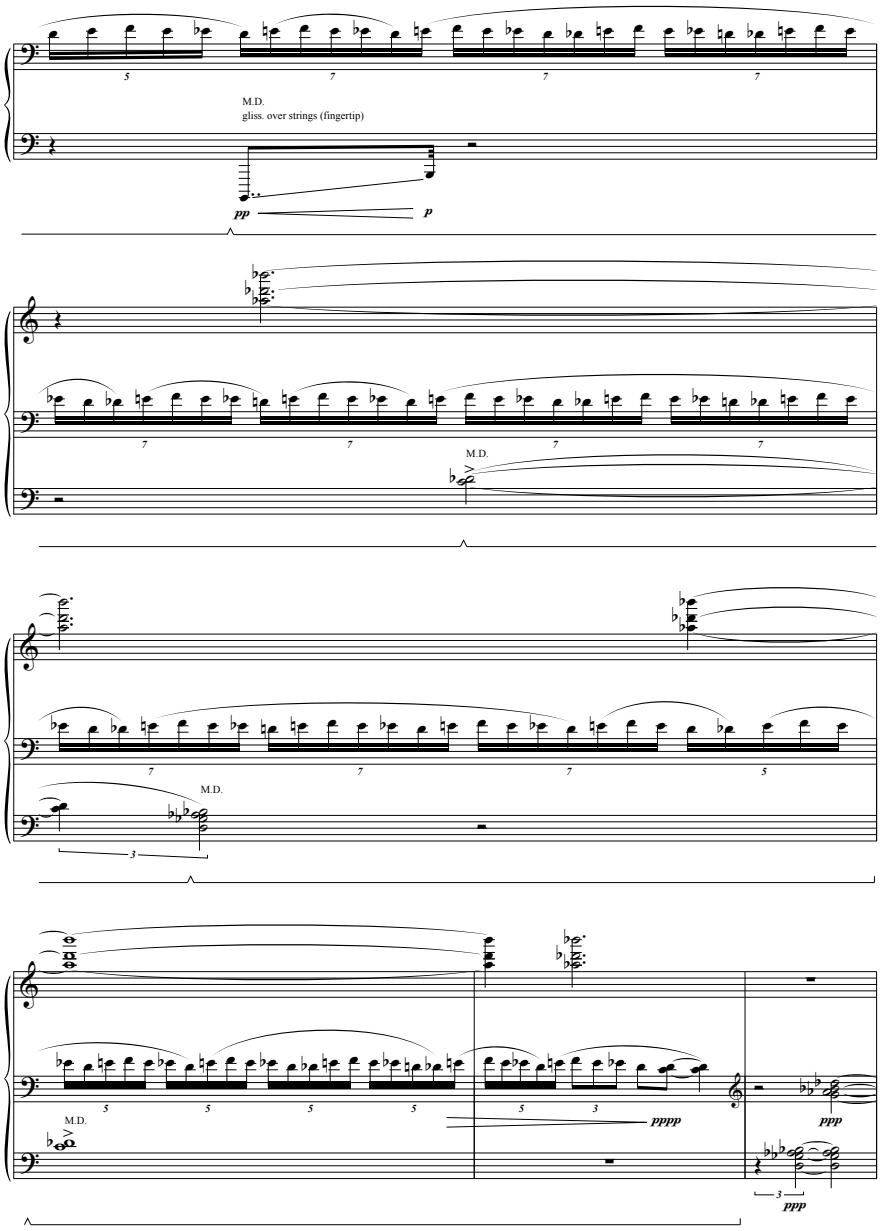

pp
pp
5:4
ppp
pp
ppp
pp
pp
ppp

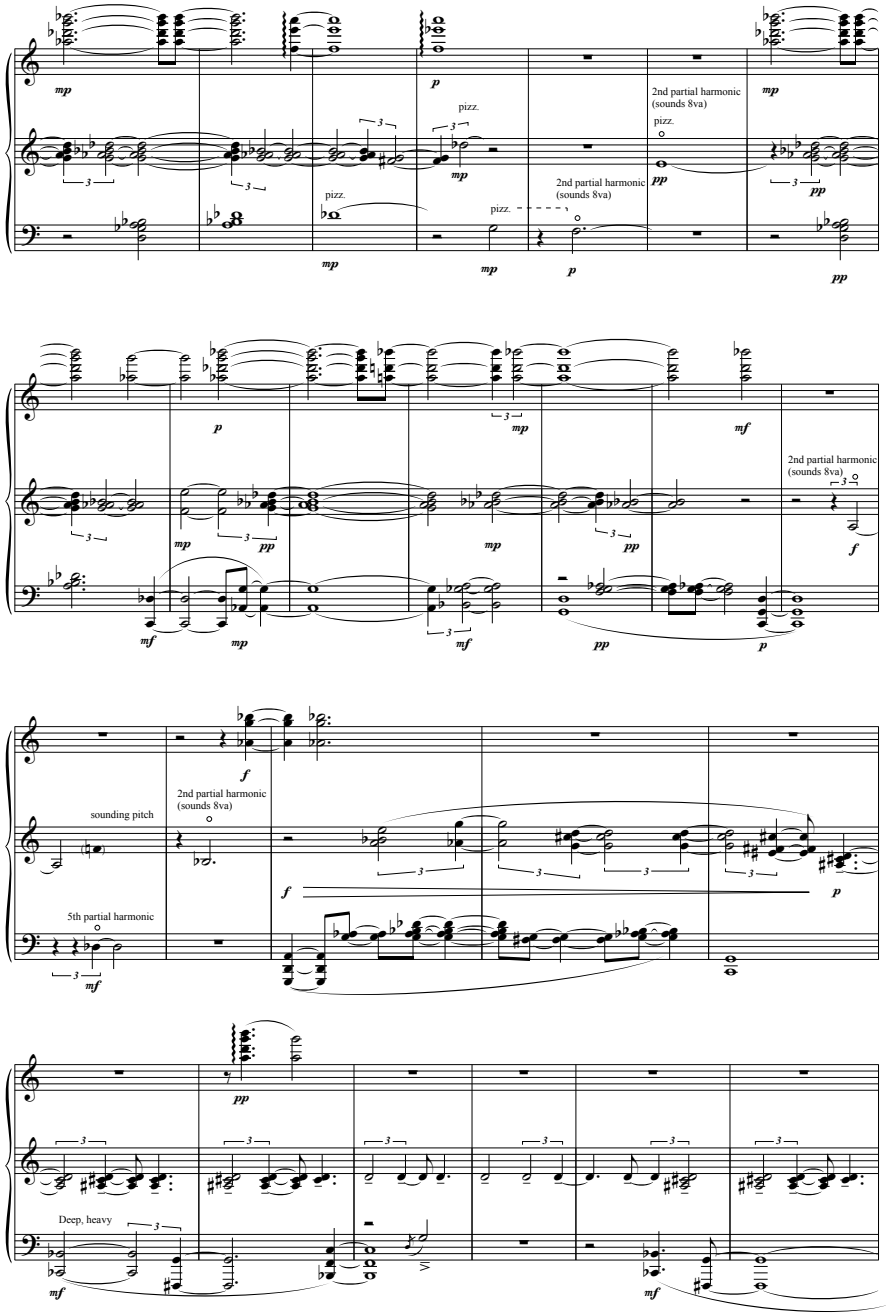

p
mp
5:4
pp
p
6
pp
p

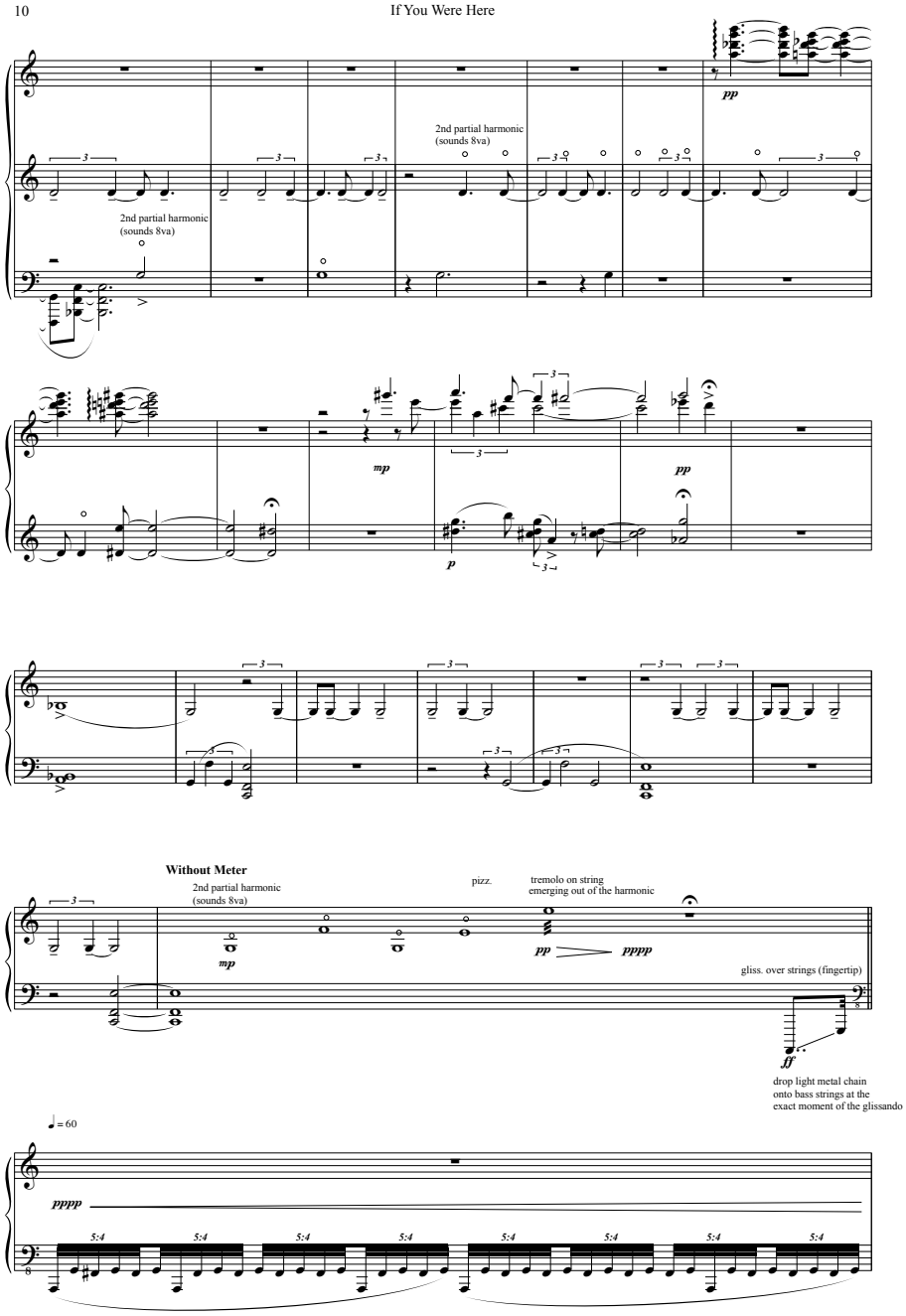

mf
f
ff
mf
f
mp
f
p
f
mf
f
ff
pp

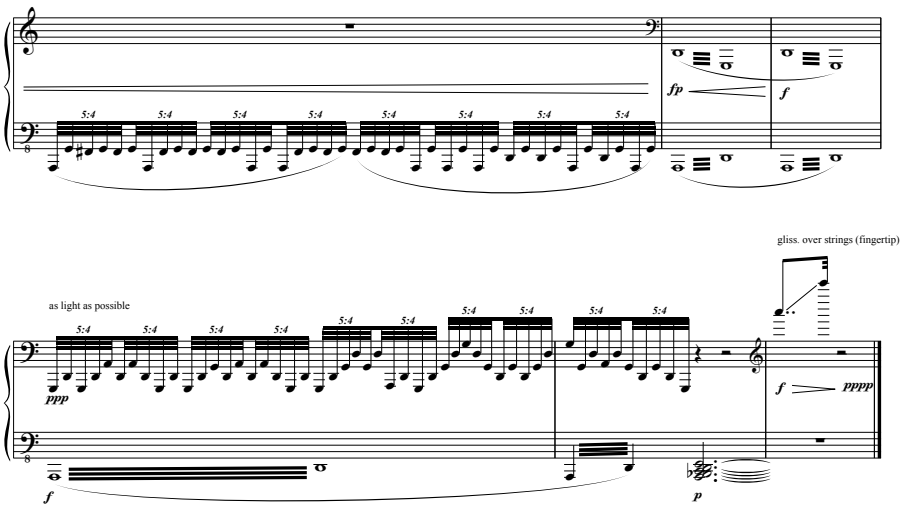

♩= 84
5:4
7
ppp
sfz
Lazy Calm ♩= 72


M.S.
pp
pppp
pp
M.S.
M.D.
gliss. over strings (fingertip)
pp
p
pp
M.D.
pp
M.S.
p
M.D.
M.S.
p

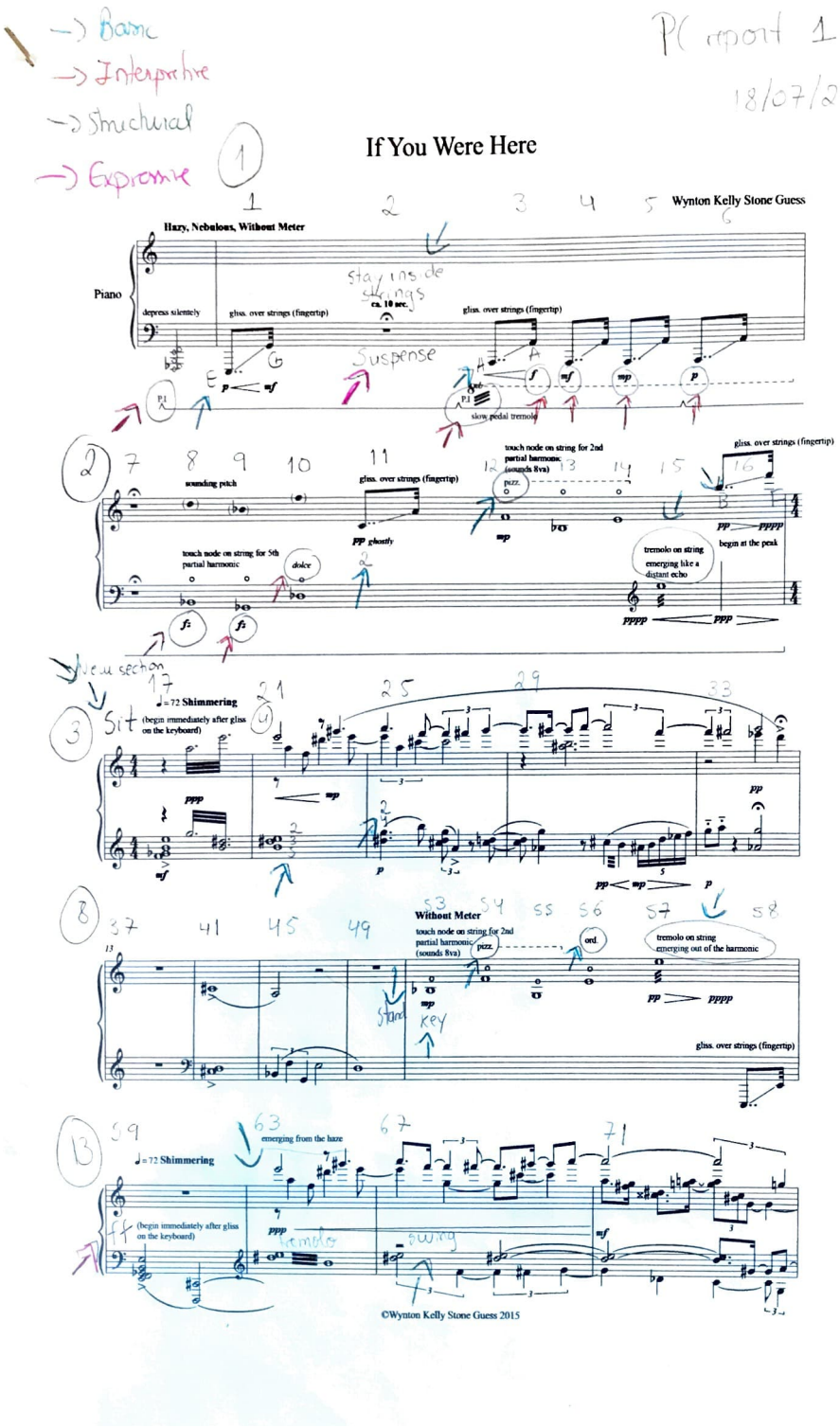

M.D.
gliss. over strings (fingertip)
pp
p
M.D.
M.D.
M.D.
pppp
ppp
ppp


mp
p
pizz.
2nd partial harmonic
(sounds 8va)
pp
mf
f
sounding pitch
5th partial harmonic
Deep, heavy

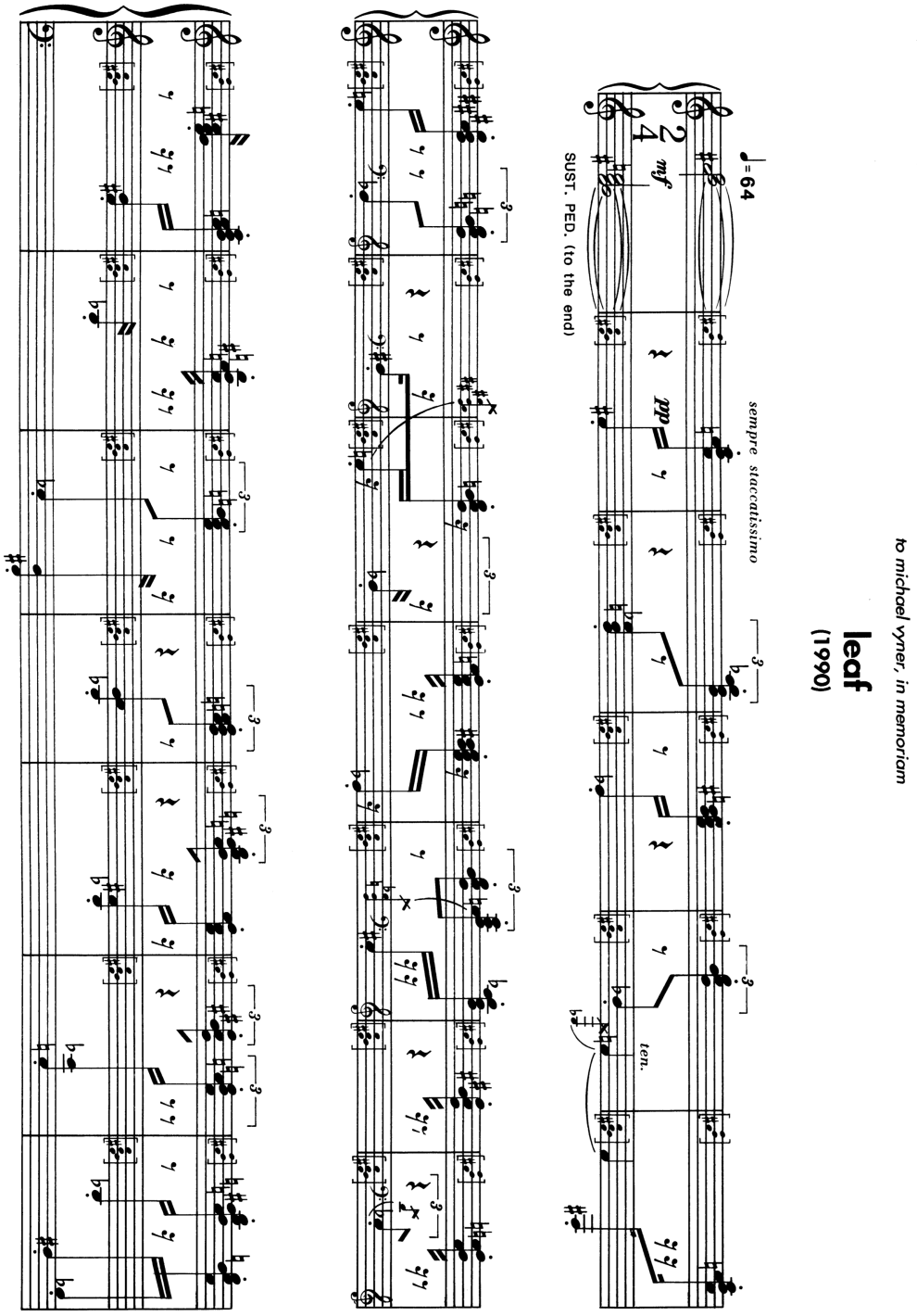

pp
2nd partial harmonic
(sounds 8va)
2nd partial harmonic
(sounds 8va)
mp
pp
p
Without Meter
2nd partial harmonic
(sounds 8va)
mp
pizz.
tremolo on string
emerging out of the harmonic
pp
pppp
gliss. over strings (fingertip)
ff
drop light metal chain
onto bass strings at the
exact moment of the glissando
♩= 60
pppp
5:4

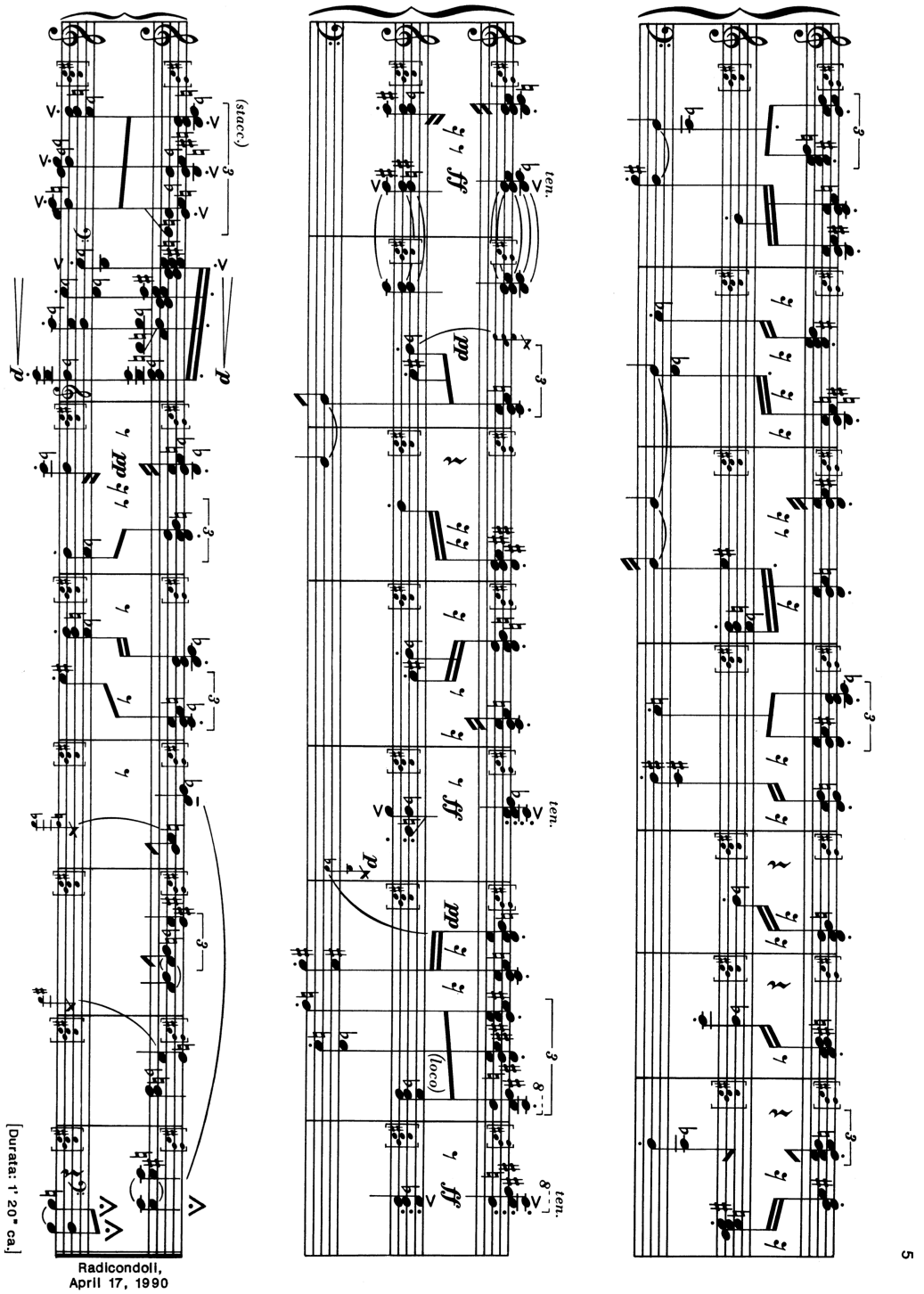

fp
f
gliss. over strings (fingertip)
as light as possible
ppp
f
pppp
f
p

APPENDIX 5: EXAMPLE OF PC REPORT STUDY 2



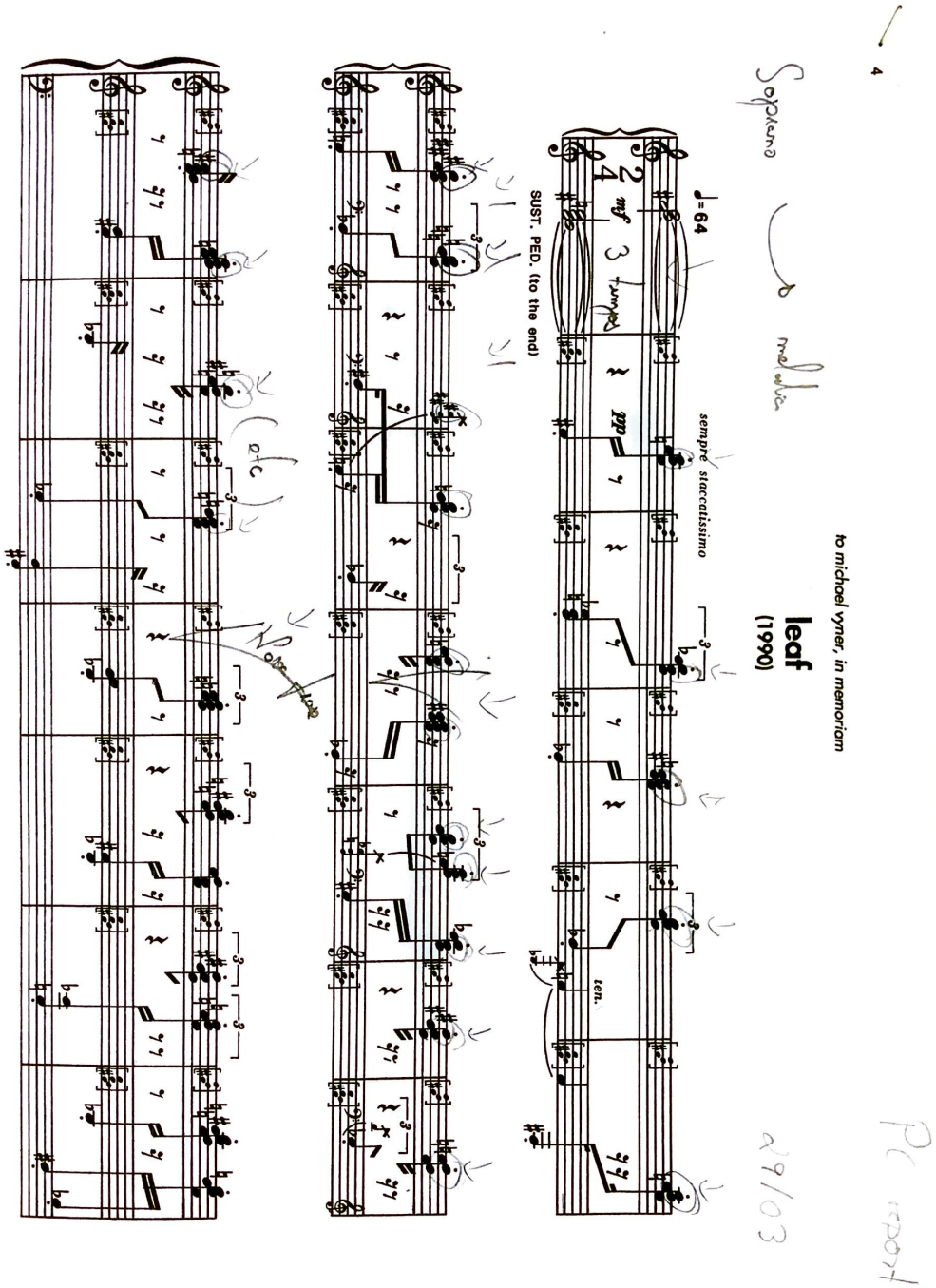
APPENDIX 6. PIECE PERFORMED IN STUDY 3



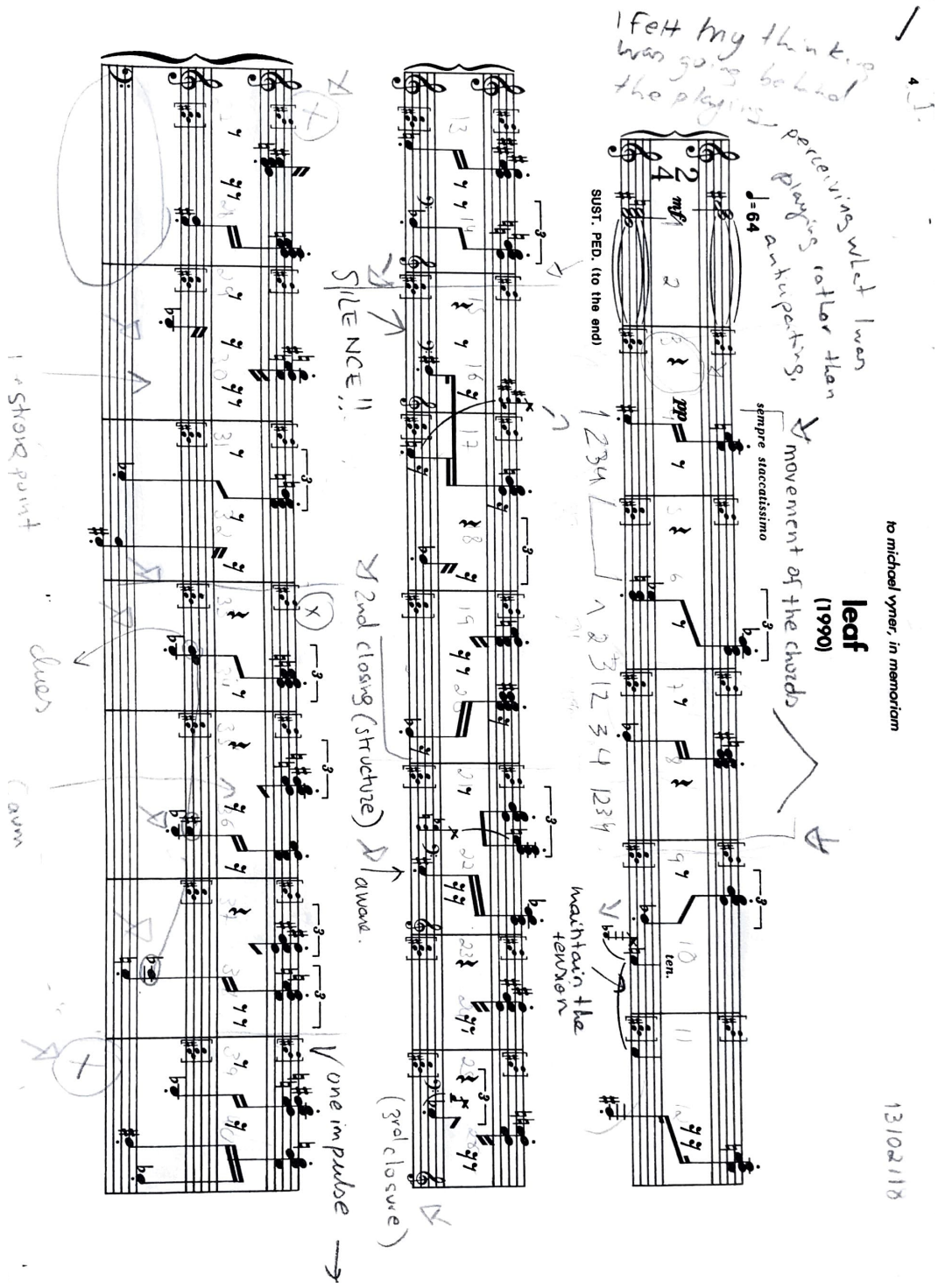

(stacc.)
ten.
(loco)
[Durata: 1' 20" ca.]
Radicondoli,
April 17, 1990
5

APPENDIX 7: EXAMPLES PC REPORTS STUDY 3

APPENDIX 7.1. PC REPORT EMMA



APPENDIX 7.2. PC REPORT SOPHIA



APPENDIX 8. INTERVIEW TRANSCRIPTS PROFESSIONAL MUSICIANS

8.1 INTERVIEW TRANSCRIPT ANDREW BALL

V: First of all I would like to thank you very much for your collaboration in my project. I am a doctoral student at the Royal College of Music and I am working on the topic of memorisation in specific styles of repertoire. Do you have any questions before we start the interview?

AB: I don't think so.

V: I know that you have played a wide range of repertoire, in which chamber and contemporary music have important roles. Can you tell me more about this? Which composers do you include in your repertoire?

AB: Well, most things actually. I am a very quick learner and a good sight reader. For example, I did many recordings for the BBC of things that were on the fringe of repertoire, rather than central repertoire pieces. And a lot of contemporary music, but not solely contemporary. For instance, I remember doing some piano music of Max Bruch, which is very little known, little played. But the thing was that I was able to learn things like this very quickly and there is no harm in playing something that is not terribly good if you can learn it quickly. If you have to spend a long time on it, then it becomes tedious. I did a lot of contemporary music.

V: What styles of contemporary music do you usually play?

AB: Everything, really. Certainly, including what was then known as the *New Complexity*, for instance composers like Brian Ferneyhough. But this was very dense, atypical music, it was almost impossible. It was written in a way so that there was a situation where the composer would give you something that was pretty well unplayable, and the artistic event of you confronting this was to produce the tension and the drama, so you were, in a way, sort of afflicting [laugh]. But that was not everything I did. I never felt very comfortable doing things inside the piano, but I did do quite a lot of that with varied degrees of success, but I noticed very much that my students who play inside the piano pieces these days are much quicker and much more comfortable with them and they seem to be terrified of them much less, if indeed at all.

V: Why were you not so comfortable with pieces inside the piano?

AB: Well, I think it is a question of newness, and the fact that not many people would not do that then. Once you know that there are lots of people who could do such thing, it gives you courage and confidence. You develop a practice that almost passes on from generation to generation. The former finds very difficult and the next generation finds it, if not easy, than easier.

V: Do you memorise your repertoire?

AB: Some things, but increasingly not. The main repertoire pieces I would always play from memory. Beethoven sonatas, certainly most standard concertos and particularly virtuoso concertos. Playing something like the Tchaikovsky concerto does somehow feel very strange to play with the music. But, as I say, learning a lot of out of the way music quite quickly, it would have been a luxury to play it from memory. If I do play those things from memory it would have take a lot longer and I would probably got bored [laugh]. I would never say that of something like Beethoven's last sonatas, but for example Max Bruch's piano pieces, which are interesting, but minor romantic music, what is the point, really? [Why] spending a lot of time memorising it if you are going to play them once and people are going to listen to them very occasionally. And I noticed that in a professional way there is a great tendency now of playing from the music. More people are using the music in a wider range of repertoire. And also people are using the music in a more free and easy way. For example, I went to a recital some years ago by Richard Goode at the Queen Elizabeth Hall. It was a magnificent recital, but he started the first half and the second half with the Bach's *French Suite No. 1* and the second half with *French Suite No. 5*. The *Suite No. 5* and the rest of the programme he played from memory, but the first with which he started the recital he used the music for it. Well, that was obviously a fresher piece for him, because he was not quite so confident, or he could feel more confident with the music, and I think that is very healthy. In the end what matters is the musical effect of the performance that you are trying to give. What is the point of ruining a performance if it is going to be insecure from memory? Of course, if you have a situation where you have plenty of time, then I think there is nothing like a performance from memory and the communication with the audience for the feel that you are really feeling, that you are really communing with the composer. I am not saying that I think it is a bad thing to do it from memory and I think that ultimately it is a good thing, but I think one should just do whatever the situation or the piece demands. After all is crazy the whole tradition of playing from memory. Imagine sort of explaining to a Martian, from out of space [laugh], 'well, piano solo, piano concertos you must play from memory, violinists must play concertos from memory, but sonatas from the music. If the violinists play from memory, the pianists should play from memory as well. Wind instruments don't tend to play from memory at all'. It's crazy, it's just traditions that have arisen and I think that they are unnecessary. Just do whatever is going to produce the best performances.

V: You said that you prefer to play standard repertoire from memory. Why?

AB: Well, apart from anything else, if your memory feels confident, than there is nothing like playing from memory. One feels a little bit freer and you don't have all that business of worrying about having a page turner. I have seen concerts where there has been a page turner, perhaps not a particularly good page turner, or a page turner who looked a bit peculiar. This can be distractive. On the other hand, I remember doing a concert at the Wigmore Hall where I did quite a lot of things from the music and a very good musician, who was Head of Winds here at the time, came to me and said, 'It's amazing how you memorised all that repertoire' and I said, 'But I didn't, I was playing quite a lot of it from the music' and she said 'Were you?' So, I think that is because I thought about it a lot. I did use a page turner but he was very discrete. So she actually didn't notice that I was playing from the music.

V: And when you decide to use the music. How do you plan for the performance with the score?

AB: In my experience what definitely doesn't work is to suddenly play from the music. If you plan to play from memory, when you have a moment of anxiety and at the last minute you decide it's not secure and then you play from the music, this to me is a disaster. I have done it a couple of times and never again, because if you are playing from the music you have to really practice playing from the music and integrate [the score] into your performance. If you suddenly decide to use the music, then in my experience you don't really know if you will look at the keyboard, or dots on the page and this is a disaster.

V: With contemporary repertoire, do you always use the music?

AB: Nearly always.

V: And how do you integrate the score in your performance?

AB: If it's a traditional score then there is no difference really from playing the 19th century work with the music. I will try to find a real reliable page turner which is also discrete, and rehearse and practice with the music and actually think about where I will be looking at the hands, or where I will be looking at the music, where I still have sort of spotlights.

V: And you mentioned different styles of contemporary music, prepared piano, new complexity. Is there any style that you would prefer to memorise?

AB: The really complex contemporary music, even if it's not *avant-gard* just takes so long to memorise. A piece I was determined to play from memory and I did, was Michael Tippett's *Sonata No. 3*, which I worked on for a long time. I played it,

although I said to myself, if I am going to play I need to do it very well and my performance of it became quite well known. I really wanted to memorise it and I did. And it didn't take me actually so long to memorise, I basically memorised it in a month and it's a lot to memorise, so this was quite a fit. But I never felt I could carry any pieces like this. To work on that piece, to do it within a month was very difficult and then every time I had to play it again I had to rework it again. So this for me was a like a special piece because I really loved it and wanted to give an especially good performance of it and spend that time memorising it, but I wouldn't do that very often. I had to feel a particular need, a particular drive to do it.

V: I would like to know more about how did you practice that piece? What were the stages in memorising?

AB: In memorising? Well, fingering, fingering, right from the beginning. As I say, I am a good sight-reader, so for a little while, in the very beginning of learning something like that [Tippett's *Sonata No. 3*] I would just sort of feel my way through it. This is a very hard piece and it's really impossible to sight-read, but however inaccurately I found it useful, just a few times, to kind of trying and feel my way through it, feel it almost with my arms rather than my fingers. But then the real work starts and fingering is vital. My copy looks like there is more pencil than printing there. Fingering is important in order to play the piece any way, but to my mind it's vital for memorising. Memorising and fingering go absolutely hand to hand in my experience. Then I would be very rigorous, I would determine I was going to learn 17 bars each day, maybe not a huge number of bars, but I would do it, I would made myself do it, I would made myself memorise it even if I was still playing at half past midnight, so that I knew that I was building it up within a time frame. I am personally much better working like that if I know that I have got a month or six weeks to learn something and I could divide it up and, somehow I am going to do it.

V: And in terms of types of memory, which one do you rely more in this kind of piece?

AB: I think what I rely on the most is muscle. Actually, I know that is not fashionable, but that is why fingering is so important to me. I think that's got the sort of well spring of the quick intuitive, reflex movements that you need for that sort of difficult frame, complex, and basically not tonal music, if it is hard to find chords that are just specific to a piece. Other sorts of memory, aural memory, intellectual memory, knowing the shape, knowing whether the possible force turns are. I always say to my students that there are some places in every piece that are difficult and they are like sort of road junctions with a big round belt. The first time you come to that you go on to this new field panicky, you don't know whether is that exit, or that exit or that exit and hopefully you get off in the right exit, but it feels like an accident. The next time and the next two times you do it. You know how is it going to feel around about, you know that there is a left turn that you must go down, you know that that looks like it is

going to be a right turn, you know you have gone away too long on turn by that tree. And you get those places in all the pieces of music that you memorise, where there are tricks or traps that you have got kind of seeing them coming, you have got kind to see a road junction coming, you have to be able to anticipate it and negotiate it.

V: During performance, when you are performing from memory. What do you think when you are on stage?

AB: I try just living the moment as much as possible. Of course one has to anticipate it, as I just said one has to think ahead for difficult moments. But, not too much ahead or you will lose the sense of being in the now. And, even more dangerous, is sort of thinking about what has happened. You may start saying to yourself, 'gosh, that was a bit of a mess, but I will try to play even better now', and in that way lies disaster. When I am playing at my best, is just living in the moment and when it really works well, and that is not by any means all the time, I feel as I am not really having to play it myself, I feel as I am sort of floating above what is happening, but that doesn't happen all that often, but that is the best feeling one has.

V: You were talking about the contemporary piece, but in the case of tonal pieces, do you memorise the same way? Do you use the same strategies?

AB: Similar, I think, but I think there is more to relate to. There is more that is familiar in tonal music of the great composers that one is familiar with. You have the harmony, ones fingers can find chords rather than collections of notes that seem unfamiliar. You can find chords. To some extent, if the memory goes a little bit you can often help yourself by keeping the right harmony going, even if the fingers aren't playing exactly the right notes. It's easier to keep going. In a non-tonal contemporary piece, you are lost if you loose it. There is not necessarily any harmony. I am generalising terrifically about contemporary music, because of course there is a lot of easy listening contemporary music now. There are so many different styles, that are acceptable now, but I guess what I am talking about now is complex non- tonal music.

V: Do you have any other example of a contemporary piece you have memorised? A different one?

AB: I have memorised pieces, but I can't think of it. Nothing absolutely comes to mind because the vast majority of contemporary pieces I didn't play from memory.

V: When you decide not to play from memory. Is the practice process different?

AB: Yes. Because if I decide not to play from memory, then I wouldn't try to do any practice from memory. I don't think there is a lot to be gained and I think one decides one thing or the other. If you are playing from memory, I think is very important to go

through the music away from the piano and go through it from memory, but without actually having ones fingers playing the notes. I think that is very important. I think is also very important, I talk to my students quite a bit about this, quite often, even once you have memorised the piece, to decide in your practice how much should be from memory and how much should be with the music, because it's a disaster if all your practice is from memory just because you've memorised it. One has to keep on going back to the score for detail and inspiration and reminders. I think people vary about this, but my preference is to do about 40% of practice from memory and 60% from the music. But I would say for some people 60% from memory and 40% from the music. Is practical as well. But I feel it should be within that sort of bound, you know.

V: And what are the main differences when you practice from memory and from the music?

AB: I think that doesn't need to be a difference. But I think that one of the biggest differences is that it is easier to listen to yourself when you are not looking at the music, but I think that is something that you can learn. I don't think it will automatically follows or is automatically necessary, but for a lot of pianists, when they are playing from memory, they are listening more carefully to themselves, so for those pianists, when they play from the music, they have to learn to keep on listening and not get distracted about this thing in front of them. However, I would say that for some pianists and some repertoire, sometimes there could be a freedom in playing with the music. Sometimes taking the pressure of the memory can disinhibit too, release new sort of freedom, creativity and I think everyone suffers from some sort of nervousness about memorising, even the greatest musicians. Busoni said that 99% of nerves is the fear of forgetting, which is extraordinary for Busoni, because I he was extraordinary and had such an intellect. For people not much intellectual, one can imagine them being rather terrified by the idea of forgetting. But to say that for Busoni is really extraordinary. I think this part of of something psychological. We always have something to hang out, sort of nightmares (laugh). For pianists is forgetting, for singer is to do with their throats and their larynges. We all have something that we have to hang out on (laugh).

V: Do you have any specific strategies to avoid memory failure?

AB: No, I mean, analysis is the biggest tool, I think. Fingering as I said is very important, but also analysis of the piece, so that the notes make sense to you and you know how they operate with each other. This in the case of tonal music harmonic analysis, of course, particularly analysis of the left hand. In my experience, students have memory laps 9 out of 10 times in the left hand.

V: And with non-tonal music? What kind of analysis do you do? Do you also analyse?

AB: Non-tonal music? Yes, I would still analyse.

V: How? What kind of analysis?

AB: It depends on the piece. You have to find a way into it and, of course, if the style is unfamiliar it might take a long time before you could see why the notes there interact with each other. Of course you may never discover that, but if you can't discover that, memorising becomes very difficult and very tedious, because it is like learning something in a language that you don't understand, so you are just learning phonetics without learning the meaning behind the words. It doesn't have to be a specific sort of analysis and, in a way, it doesn't even have to be something that the composers intends, but if it makes sense to you, then it will help. I use analysis in the broadest sense. I am not talking about Schenkerian analysis, although it could be. I have said to students before, if they are argumentative, if they say, 'I don't see any mean for analyse this and I want to play how I feel the music'. I always say, 'but when you play it that in itself is analysis. Performing a piece is a sort of analysis, you can't stay neutral. You are analysing it by playing it, so you might as well do a good job with your analysis and be conscious of it.

V: Coming back to Tippett's sonata. In this case, did you collaborate with the composer? Closely?

AB: Yes.

V: How was the collaboration?

AB: It was great. I used to go to the middle of the countryside and I use to go down by train and we would have a coffee when we arrived and it was always the same pattern. I would work with him on the piece, maybe an hour and a half, maybe two hours, then we would stop and then we would have meetings before lunch, then we would have lunch and then we would go for a walk and then he would talk about all sorts of things, or he would ask me about things. Sometimes even talk about the piece that we were working on more often. I spent quite a lot of time with him and nearly about half of that time was actually on the piece.

V: What kind of work did you do?

AB: He had very exact images and sense of the drama and the effects and the sort of progress of the piece, the way the piece had to lead from the first note to the last note. He was not very interested in the detail at all. In fact, on the older pieces that I worked, because I have worked the sonatas with him, when I felt dubious notes in the score that I wanted to ask him about he would say 'Oh, I have no idea, it's so long ago since I have written'. He is not interested in pieces that he had already written. He was

interested in planning his next pieces. I found very interesting that when he was in his eighties, he was not really interested in reminiscing, which in a way slightly disappointed me, but there are creative people that are still already creative in their eighties and this is very characteristic of them. They want to talk to people and find out new things rather than being protective by old things. The same with Joseph Horovitz. He is still teaching here and he is 86 or 87 now, he goes to my concerts and he askes me what are you playing and asks me questions about it.

V: In what way do you think your collaborations with living composers affect the way you prepare their works?

AB: Of course it gives you a particular edge when you make discussions around these readings, but I don't think it made any difference to the way I have prepared it. I hope that I prepared other things as carefully as the sonata. I spent a lot of time and a lot of care preparing that piece. But as I have said I didn't necessarily memorised many other contemporary things, but I hope I was as carefully as I did that. I passionately believe that all pianists, all musicians, should learn new music. Even if they are not really interested in, they should learn at least one piece and work on it with the composer, because immediately when you start working with a composer, particularly if it's not an articulated composer, you realise the limitations of notation. You work carefully on a piece, you look at every marking on the score and you do your best to build a relationship with the piece and you play it to the composer, wait for what he says, and he says 'it's not really like that at all, you are making it so serious, much more lighter piece'. Then you think, 'well what would Brahms have to say about something you have played?'. Composers can't always mark and indicate these things on the score. Yes, there are markings of course, you can write *scherzando* or *leggiero,* but it's difficult to know whether you are doing what the composer wanted. Other than that, this also leads to a whole lot of considerations about whether you should worry if you are not doing what the composer wanted. Is what the composer wanted necessarily the best thing for the piece?

V: Yes, good question. Do you have any other collaborations with composers?

AB: Yes, many.

V: Can you tell a little bit more about it?

AB: Certainly, the worst thing is when you think, 'ok it's a new commissioned piece that turns out to be the hardest thing when you play through it and you think, this is just not very good but I have got to play it'. In those cases you have to be like an actor. We have all seen great actors in not very good plays, or sometimes, maybe in a soap opera or television, but they are always recognizable as great actors. Somehow you have to believe, when you are playing a piece that is not great, that it is indeed great. You have got to believe in it, just suspend your disbelieve and imagine that this

piece is wonderful. In my experience you can't perform properly unless you feel positive about the performance. It is hard enough anyway, but if you introduce negative emotions then it's impossible.

V: Just one last topic. I would like to talk about skills. What skills do you think a performer should have in order to be able to prepare contemporary music and, for example, to memorise it?

AB: I don't know whether it's a skill, but plenty of courage.

V: Courage [laugh], yes.

AB: Sometimes if it's a new piece, it's like seeing a mountain that no one has ever climbed. You have got to have the courage to believe that there is a way of getting to the top. Patience, because a lot of these pieces can take a long time. Having the patience of just to go bar by bar and not to loose heart. It's interesting your question, special skills, because in a way I have always foreshy of this idea that there are contemporary music specialists. Of course there are, but actually anyone can play contemporary music, because it is music, and basically it needs the same qualities of technical expertise and imagination, intellectual control that we would be using in all the other styles. But I think, in all honesty, that patience is important. Of course there are extended techniques and things like that where we probably do need to have a bit of training and the specialist knowledge, but it's amazing how much you can conquer in new music just by using new musicianship. Thus, you need musicianship, intelligence, quick thinking. There is one specific thing for pianists, one specific sort of music which I think does needs a technical skill and this is for music like Boulez's *Structures*. In this case body language. Your way of playing should barry the character of the music. So if you are playing a stormy piece of Liszt you should not look like a mouse, and if you are playing Mozart B minor Adagio, you need concentration and stillness, so it's probably a mistake to be moving around at all too much. But in the case of Boulez's *Structures* or this type of musical genre, if you were to mirror the sound of the music you would be dislocating all your joints, so I think you then have got to kind of find out a natural sort of smooth, physically free way of executing and combining the movements together, so that you make it easier to perform. Actually that applies to quite a few styles and types of contemporary music, I think. You have to find sort of a physical flow to negotiate the musical objects, which can be very extreme.

V: Those skills you have been mentioning, do you think our education background prepare us to have them?

AB: Not really. I think there is still a lot of kind of fear and lack of understanding. I was Head of Heyboard here [at the Royal College of Music] for six years and I did

quite a lot to introduce new music here. And my experience with the teachers was that everyone was in favour of it. There wasn't a single person who was against it, but they didn't necessarily played it, they didn't necessarily know how to teach it and they didn't necessarily know which pieces from the repertoire were good to play and which pieces weren't, so I think there is a lot of education to be done there. Taking away people's fear and ignorance is important.

V: What do you think needs to be changed?

AB: I think is changing. I think one needs to change the pianists' mind, we need to take more new music into their repertoire, and that is happening, there are pianists who play huge amount of contemporary music and standard repertoire as well and I think a lot of pianists are doing that. Plus, getting back to the idea of the composer-pianist, someone like Stephen Hough writes, not particularly in an avantgard style, but he composes a lot and, you know? Of course he is a wonderful composer, wonderful pianist and I think, as I said before, I think all pianists should work with the composer at some point and I think all pianists should compose at some point, just to experience the difficulties of actually putting notes down on paper.

V: Have you ever experienced composing?

AB: Yes, I used to compose when I was in my twenties. It is all rubbish, but you get that feeling of being a composer.

V: Ok, so these were all the questions I had for you. Is there any anything else you would like to mention, you want to talk about? Any question?

AB: I don't think so. Ah, I should have mentioned this. I also performed pieces by James Dillon, a composer of *New Complexity*. There is an interesting thing with that. I played an ensemble piece of his with a very difficult piano part, all over the place and very complex and it was all quiet and it was all between *piano* and *pianissimo.* It was a piece for piano and brass. The composer was at the rehearsal and we rehearsed the piece and the brass was playing quite loudly and you couldn't hear the piano part and the conductor asked me to play softer, so I played softer, and I could tell that no one could hear me at all. So James, who is a nice man and I respect, he came to me and he entered and said, can I just hear the piano part by itself? And I said, 'but why? It is inaudible', and he said, 'well, it has to be there, so I need to hear'. Well, it was a little unfair really, you could hardly hear it. But somehow, even though you could hardly hear it, he wanted to make sure that it was right.

V: How was the practice of that piece? How long it took?

AB: Of course a long time. Slightly longer than the time I had [laugh], which is very often the case. One of the worst things in playing a lot of contemporary music is that composers, you know, you have the scores at the very last minute.

V: Yes. Of course. Ok, thank you so much for this interview!

AB: No problem, we will keep in touch.

8.2 INTERVIEW TRANSCRIPT ANDREW ZOLINSKY

V: First of all I would like to thank you very much for your collaboration in my project. I am a doctoral student at the Royal College and I am working on the topic of musical memorisation in specific styles of repertoire. Do you have any questions before we start the interview?

AZ: No.

V: I know that you have played a wide range of repertoire ranging from early baroque to avant-garde music. Can you tell me a bit more about this?

AZ: If it is a piece I feel I can bring something to and I want to spend a lot of time with and I know I am going to play it many times, then whatever the style is I will play it. The idea of whether I am a new music pianist, or a traditional repertoire pianist, is kind of irritating, really. I guess the main focus of my repertoire most of the time is 20th, 21th century, but I do play quite a lot of the romantic repertoire as well. In my recital programs I like to bring the past and the present together. To take an example, I did a recital program a few years back now, where I played some Debussy, the second book of *Images*. Debussy is a big influence on Ligeti, so I then played six *Etudes* by the Korean composer Unsuk Chin. She studied with Ligeti, and her *Etudes* do share quite a sort of strong linage from Ligeti *Etudes* and also not really move, in some cases, away from Debussy as well. Then, the second half of the concert was a continuous set of Chopin and Ligeti *Etudes*, so I purposely chose *Etudes* from both composers that sort of went in and out of each other very similarsly. I think everyone afterwards was really kind of excited by it and hearing the similarities in terms of touch techniques, or sound, between Ligeti and Chopin. So, those are the sort of things that interest me the most, and I do have an interest not just in contemporary repertoire, but also the less well-known repertoire from 19th century, 20th century. As I say, if it is good strong music and I think I really have a passion to play it, to work on it, and to share with the listener, then that is a good enough reason for me to play.

V: In the case of contemporary music, do you have any preference for any style?

AZ: Not really, it's the same thing. I mean, the composers that I am mostly associated with are quite wide ranging. Unsuk Chin in some ways is quite hard to categorise. I suppose I would say she is a sort of Western Modernist, but she comes obviously from Korea [laugh]. Her initial musical training was all in Korea. Ligeti was the first Western person she studied with. So, there are cross influences in her music, and she is very influenced by other art forms as well. David Lang is an american composer that I am very associated with and I suppose he can be considered a pos-minimalism composer. He could be further from Unsuk Chin and some of the other composers that I have played. I think what attracts me to his music is that he is very quirky, so unusual, impossible really to picture it all. If we want to put it in a box as the label post-minimalist on him, if that helps people, ok. But I don't know, I don't actually think it does. I think all these labels just drive me nuts really, because I think they can be a real barrier to people actually investigating the music, because someone who is not fond of minimalism will say 'oh he is a a pos-minimalist composer, so I don't even bother investigating that composer'. But in David's music there is a very intimal emotional world about it as well and he doesn't write very idiomatically for the piano at all. For instance, his *Memory* pieces. I premiered in New York, the complete set anyway, about in the year 2000, or 2001. I am still playing them regularly now and I still love practising them and I still find new things in them all the time. I recorded them about six years ago and I want to record them again, actually, because I feel I have gone somewhere else with them now. The other two composers I should mention that I am associated with are Simon Holt, wonderful British composer, professor at the Royal College of Music as well. Again a very unique sound world, I think he has a very easily identifiable harmonic world. There is a toughness about his music, there is no doubt about that, but again I just love sort of proving quite deeply into it and I think there are some wonderfully strong and striking things particularly in his orchestration. And the last composer, also British, is Michael Finnissy, who I think, in time, people are gradually coming around to realise what a very great composer he is.

V: Do you play your repertoire from memory?

AZ: Contemporary repertoire?

V: I am asking about all of it, so what repertoire do you play from memory and what repertoire do you play with the score?

AZ: Well [laugh], my traditional repertoire I play from memory, yes. Some contemporary but not all. Unsuk Chin *Etudes*, for instance, I don't play from memory. I think they would be really challenging. Funnily enough, we had a conversation about her piano Concerto, which I played, and she was slightly kind of winding me up about this. She wanted to do a concert with all her concertos and Viviane Hagner, who plays the violin concerto, and Alban Gerhardt, who plays the cello concerto, play

these concertos from memory. So she said, 'you have to play the piano concerto from memory' [laugh]. It is a ferociously difficult piece. I think it probably is much easier to memorise though. I think I could see myself doing it. The thing is, the piano concerto struggles to get performances, because it is probably harder for the orchestra than the other two and so, therefore, Alban and Viviane have played their respective concertos so many times and they have now come to a point in the last, I don't know, two, three years where they felt, 'ok, I have played this twenty times, I can do it from memory'. In Unsuk's *Etudes* also the notation is very problematic and I think that affects the photographic memory very much, because a lot of things are actually hard to read right out and you have to rewrite. I think most pianists that have played her piano *Etudes* have done the same thing. Not in all of them [Unsuk's *Etudes*], but certainly three or four of the six. Until you kind of really load in what you have re-written out it is very hard, I think. It's a little bit of a barrier to memorising. The David Lang pieces, some of them I have played from memory, some of the faster more minimalist linked ones I think they can be problematic. One has to spend so many hours practising these things that hopefully, you know, after a time, one would play them from memory. But I think there are so many barriers in contemporary piano repertoire to play this music from memory. One is notation. I think another is just the fear induced by the extreme technical/physical demands of the piano writing, demands that often verge on the impossible. I think all of these composers know this. Going back to Unsuk Chin, I remember in an interview she gave she said that she knows she writes things that are really beyond the possibilities of a human being to play, but each person finds their own way of solving the problems. So, again, I could maybe see a time where all this music could be from memory and there are certain things that are leaping around all over the place and you have to watch what your hands are doing, and you can't actually be glued to the copy. But I think, also in terms of structure, sometimes there are not obvious patterns or structures, they are sort of a little freer than in Beethoven' sonatas for example. Therefore you got so little to hold on to in order to play some contemporary music from memory.

V: What makes you decide if you are going to memorise or not?

AZ: Good question [laugh]. Well, I think I set out to memorise 95% of what I play. Certainly, in traditional repertoire there is an expectation.I think that, having said that, there are pianists on the circuit, very successful pianists, who would play actually everything from the score, and I don't think there is anything wrong with that. I would admit that when I go and watch them play that there is something that doesn't quite feel as connected, and I hate myself for saying that [laugh], because the whole sort of convention of playing from memory drives me mad really, because I am sure we all really fear memory loss more than anything else in performance. A couple of nights ago I had to play Rachmaninoff Concerto No. 2 in London and this is a piece that I have played many times and it's fine, I touch boarded it, it went very well, no memory problems. However, I know, in the back of my mind, that it's so easy to fall

down the hill in these pieces and I do often wonder 'gosh, if I just took that step and just played everything from the score, what sort of difference would it make to my playing?' But to answer your original question, as I say, I set out to memorise everything. If due to the complexity of the score or restriction of time, if somebody has asked me to learn something very quickly, I will end up using the music. I think one just has to do it without sort of feeling embarrassed about it. I think it's very obvious to most people the difference between someone using the music as just security, because they feel a little insecure from memory and someone who is quite sight reading on stage, because they are using music they haven't prepare well enough. I think it's a terrible judgment people make according to if the pianist played from memory or not. But having said that, as I said, I do think somehow it looks a little sloppy, I have to say, a pianist using the score than it does a violinist, or a cellist.

V: And in your case why do you play from memory? What advantages and disadvantages do you see in playing from memory?

AZ: I think it forces you to really know the music. You really have to know the details. I suppose I do feel freer with the repertoire I have played for many years from memory and I do have a certain sense of freedom, particularly when it is very busy and virtuoso music. As I said, you have to really look at what your hands are doing, so I think there is a sense of sort of freedom this gives you. But I think, the fact that you really have to go into detail, it forces you to really, really, really practice things in a way that one could get away with not doing if one just gave oneself permission to play from the music. Many years ago, probably thirty years ago, I remember a very well known name, highly respected british pianist, played one of Rachmaninoff's solo piano music at the Wigmore Hall and decided, obviously due to all the things he had to do at the time, to play the whole from the music. There were many fantastic things, but there were also some moments where I sensed there was a reliance on the fact that he had played this before and the score is there in front of him, so he can kind of cling on into certain things. I am not just even talking about whether he played the right notes or wrong notes or how accurate he was technically, but actually just the interpretation, just that feeling of digesting the music.

V: Now I would like to focus on how do you memorise. Can you describe me in as much detail as possible how do you memorise? I don't know, you can give me different examples of pieces that you have memorised before.

AZ: I think the first important thing is fingering. Well, let me go back a stage. The important memory functions are physical memory, aural memory and in some cases people have a photographic memory. When I say photographic memory I don't necessarily mean they see exactly what is in front of them, but you have a sense of where something is on the page and somehow that ignites the memory. So, one has to think about how one is going to really ignite those aspects of memory. For physical

memory, I think it's very important that you sort the fingering out. I am always going on about this to my students, because there is a printed fingering in front of them and I see they do something different and I know it is going to cause memory problems, because this means two things: number one, possibly a decision hasn't been completely made, so without realising when they are practising, one time they can be putting the third finger down and other time they can be putting the fourth finger down. The other reason is that what the eye sees and the brain computes is different from what the hand is doing. So the eye sees third finger, sends that message to the brain because it's finger three on the page, but the hand actually puts the fourth finger down, so it's like any computer where you have conflicting information and it is just not giving you anything back. In the beginning, you need to know exactly what you are doing, because then the next thing, I think, is to play very slowly and then uploading that information into sensory memory. And doing that very, very slowly and then increasing tempi, but always with all the details in place, so dynamics, articulation, phrasing. Those are important sort of physical memory things. Beyond that, I think it's important to play through a piece and to get an overall sense of what is happening and to see where the key sort of structural points are, where the main structural points are, what keys are you going through. Because I think if you do happen to have a little moment of memory loss, that can get you out of trouble. You can feel, 'I don't know quite where I am here, but I know that I need to be aiming for F minor here'. I think those things are very important. I think it is really important to put everything in right at the beginning of the process, dynamics, everything, because again, coming back to physical memory, the physical sensation of playing something *staccato forte* as opposed to *legato piano,* is completely different. So, we are still, as I said, loading the right information, we are creating the right habits. Hopefully, then, if all those things are in place, it is really just then the repetition or practice of a passage hands separately. To take, for instance, the Rachmaninoff concerto No. 2, I remember when I first learnt this piece, about thirty years ago, I learnt the left hand from memory by itself, because the left hand is always very hard in Rachmaninoff, and doing that was a big plus for me. It gave me so much security to do it. So, a lot of hands separately, really, so that we are securing the physical memory as strongly as possible, whilst at the same time one is thinking about what is happening, the structure of the music. Sometimes when people play, let's say, a Mozart sonata or concerto, something very fast, scaling passages and they are just playing them flat, stumbling all over the place and presenting a flat landscape of note, there is no physical memory there. It is just a couple of things that are kind of dancing around, really, but if you shape them, if you decide where you are going to take even the tiny bit of shaping of a work, this creates a physical memory and also an emotional memory as well, because you remember the feeling of thinking towards this point, or that point, or of coming down a little bit here or there. So when I am talking about physical memory, I am not just necessarily talking about digital memory, I am talking about emotional physical memory as well. Did I left anything out? I don't think so, I think when those things are in place, as I say, is then much more the fact that we have

to repeat and repeat and repeat. One other thing I do do is, for instance, slow pieces are notoriously difficult to play from memory because we don't create a physical memory with them, because we just sit down and sight read. So I very often play a Chopin Nocturne, for instance, twice the speed, so I create a physical memory which then I can slow down. I also propose this to my students. And the opposite works too, because when we are playing fast music we actually need to slow down to load the information more slowly into the brain. So you do the opposite, you play slow pieces very fast to create a sense of physical memory and fast pieces quite slowly.

V: In what stage of learning do you start memorising?

AZ: I don't do this. Some people have this method where they open the book and play eight bars and play it again and again and again and they shut the book and then they play and shut the book again and do another eight bars. Frankly I just can't [laugh]. I really don't see a sense in that. I just feel you have to allow things, if possible, to take the natural course. There is a moment when you realise 'ok, I feel quite secure with this'. By that I don't mean one can just kind of sit back and let it happen at some point in the year, but, you know I am pushing myself the whole time, I am pushing my students to get to that point, so you can't keep things too sort of slow for too long and there comes a point where you have to open the cage door and let the bird fly away as it were and just take the chance of how it's going to be. But I think, I will put it in this away, when I have had to learn things in a hurry and therefore I have had to make myself memorise them and try maybe see them than I would otherwise, they are ok for that concert, but then two months later they are just gone. So, I think, if possible, and, as I say, it's not always possible, but if possible I think it's better to just let nature take its course, and I think [this can happen] if you are doing these methods of uploading, you know, it's really uploading a slow version of the fast. Let's say the virtuoso music, you need to analyse what you need to do at that speed and slow that down. I think one mistake people make when they practice very slowly is that they move very slowly too, so the movements they are making have no link with what they are going to need at that speed. So, if the left hand is jumping around, for instance, you can practice that very slowly, but you have to make the leap very fast. Again, that creates a physical memory, a sense of automatic movement and as long as you back that up with harmonically what is happening in more tonal, tonally based music, than that's fine. But, as I say, I think there is a a right time to kind of push things forward and try to play from memory.

V: Do you use the same strategies in different styles of repertoire?

AB: That is interesting. Yes, I do, really. Some people seem to think that there is a different way of learning contemporary music, but I really think there isn't. You know, you practice the way you practice. One other memory I wasn't saying actually and that it's very useful and that can be useful across a wide range of styles is actually

working a lot away from the piano. I think it's amazing how much one can memorise in that way. I knew somebody, many years ago, who had to go into the hospital for a minor operation, but when he came out he had to play Liszt's piano concerto No. 2, about a month later or so. While he was in the hospital he just took the score with him and then came out and could play it from memory, actually. And I did the same thing. I am not sure whether I did it from memory or not, with Stravinsky's concerto. I had to go away at all for two weeks without the repertoire and just before I left I answered the mobile phone and they said 'someone as dropped out and you have to play the Stravinsky concerto, in two weeks time', and I thought, 'oh my gosh I am not going to get the chance to actually get to the piano and practice this', but I just sat in a chair everyday day for about two hours and then when I got home and sat down at the piano I really could virtually play it. It is a really strong form of memory actually, and as I say, because you are not distracted by technical difficulties or by actually putting the right notes down, you are just purely seeing it, as I would see it when I teach somebody. That was so revealing to me. When students bring pieces to me that I have played dozen of times and suddenly I see something or I hear something, but I have never actually spotted it in years that I have been playing that piece [laugh], but it does just prove that sort of moving away from the instrument can be a real help. And this can work across the board in terms of repertoire. I would like to say there are some magical differences between how one learns contemporary music, or how one learns traditional music. I really don't think there is. Not for me, anyway. It's the same process, as you know. I was having this conversation with a good friend of mine, he is a fantastic pianist. He is at the moment involved in learning all the Ligeti *Etudes*, and in the end he said, 'I just found that if I practice hands separately I can play them' [laugh]. Yes, alright, you have to understand a little bit polyrhytmicly what is happening in the Ligeti *Etudes*, but it's no more or less complex than learning the *Hammerklavier Sonata*, or learning one of the more intense five Bach's *Fugues.* You are talking about balance of texture, layering, what to do in order to make this line come out of the other four. There is no different, really, but I think people think it there is because it's contemporary music, but I don't think there is.

V: When you are playing from memory in a performance, what do you think?

AZ: I usually think, 'why the hell am I doing this?' [laugh]. Well, what do I think? Oh gosh! I tell you what I think, actually. More and more, I try and think my way into the music. I think there was a time many years ago where I did think, 'oh gosh that bit is so difficult to', but now I don't think like that, and another thing I often say to my students when they ask 'right at the beginning of a piece what do you think?'. Well, I try and have two or three words in mind that are going to get me straight into that world, into that zone, into that space, into that emotional space or atmosphere, whatever you want to call it. So that immediately works well, as a positive distraction from negative thoughts. Sometimes, if something is really very difficult from memory, certainly in the first few performances you might concentrate more fiercily

on sequences of harmonies, or certain fingering, for example. But, as I say, I think if I can get myself in the right emotional space and I have worked hard enough on the piece, 9 times out of 10 it doesn't really worry me too much. I think concertos worry me more from memory of any period than playing solo recitals because, you know, you are not just responsible for yourself. If I happen to get in trouble in a solo recital I can take my time to get out of trouble, but when I have got 60 or 70 other people behind me in a concerto, you just can't really get yourself into so much trouble in that way or you really do need to know how to get out of trouble very quickly. I think all these things are psychological. Memory is as much about psychology as hours and hours of practice. I mean, my professor used to say, 'you know, however hard you work, you will always have that feeling coming up to the concert of…if I have had another week…' [laugh] and he was quite right. But I think, deep down, if you have worked hard enough, then is just about getting yourself in the right psychological space and in the right frame of mind and, as I say, finding little triggers that distract you from negative possibilities, because as with anything in life, the moment you start to go down that negative rode, it's very hard to reverse things and 9 times out of 10 you will end up getting you into a bit of trouble. So, just try to create positive thoughts.

V: Do you have stories about memory slips?

AZ: Yes [laugh]. I remember once playing the last movement of Beethoven's *Emperor Concerto*. There is a phrase that gets repeated [sang the phrase] between the piano and the horn a couple of times and it goes one key further the second time it happens and I just, I can't remember what I did, but I did something wrong and when the horn came the next entry sounded almost like Schoenberg suddenly for a while, because I was in the wrong key. But the most amusing thing was he was really convinced that it was him that had gone wrong, and he was just so apologetic to me after the concert for it [laugh], but I did happen to say that it was actually my fault not yours. Other than that, I remember others, I remember somebody playing a piece, when I was a student at the Royal College. The piece has a slightly spirally nature to it and she was just so nervous, she was like in a snowball that she couldn't get off. I think it was one of the longest performances of the piece that I have ever heard [laugh]. And I have heard, you know, the great and the good have terrible memory slips and you kind of remember some of them, but you also remember when quality of performance was wonderful as well and, ok, that happens, but it doesn't really matter. Is just as performers dealing with that kind of terrible feeling that occurs to you when you have a complete blank, and just not carrying that forward with you to the next performance. Some people have more reliable memories than others and obviously as people get older as well their memory fails. I remember hearing Annie Fisher and it probably must have been probably her last London recital, an enormous programme for a woman of her age, she must have been in her eighties at the time, but she had a terrible time with memory, she just couldn't remember anything. It was agonizing. I

mean, there were some beautiful, beautiful things still, but it was just agonizing to just sit there and watch a great artist crumbling this way. In that sense, I think you need to know your limitations as well. Some people take the decision that they are going to spend their whole life playing the normal sort of repertoire apart from the score and I think that, if they are wonderful artists that's their choice, that's fine, I don't think there is anything write or wrong about it.

V: Coming back a little bit. You said that very complex contemporary repertoire you don't memorise. What is particularly difficult about memorising that type of repertoire?

AZ: I think one has to accept that a lot of contemporary piano music, even it sounds wonderful and that is why we play it, it's not particularly well written for the piano. It doesn't really lie under the hand particularly brilliantly. I am not saying the majority, but a lot doesn't in the same way as playing Chopin *Sonata No. 3* does. And so, therefore, it is extremely hard to create the sense of physical memory about it. Having said that, I know enough some pianists, for example I think Roger Woodward, when he first played Xenakis, I think it was a piece for piano and orchestra. Well, he was having a real trouble with it and I think one day who was conducting just took the score away from him and he could play it from memory, so I think, as I say, when you have been living with a piece for a long time and you really got it into some sort of physical memory, then probably it is possible to do it. I could only see it happening on a concert sort of scheduled. I could see myself, if I am very secure, to play *Herma* by Xenakis from memory, but I can't believe that the next time I come back to play, a year later, I am still going to play it from memory. But I think, these days, when you are playing a lot of different repertoire, if you know that over the course of the season you are going to play Herma 34 times, that would be the time to do it from memory. But when I am playing sort of Unsuk Chin *Etudes* one month and something else another month and then I don't come back to those *Etudes* for another year, that is sort of problematic. But, as I said, I dare say that I have worked so hard in certain aspects of them that I can probably play a lot of them from memory without thinking about it. I think this has also to do with this sort of photographic, visual memory, that so often things on the page don't look as they sound in the same way as Beethoven sonata does. And sometimes notation can be a little bit messy, and I think that would worry me a little bit. For instance, although this is not absolutely confirmed, I know that by the end of next year, the end of 2016, I hope to be doing quite a major piano series in several parts of the world that is mostly Michael Finnissy, but also Janácek and a piece by John Adams and also Aaron Copland *Piano Fantasy* from the 1950s. And knowing this, I have it in the back of my mind to do the Finnissy's pieces for that concert from memory, because I have got a 15 month notice, partly because if one of these concerts comes off there will be a snowball effect and I will have a lot of opportunities to play that recital, so it is the ideal opportunity to do that and, as I say, I think we are leaving in a society where unless you are one of the five top international

concert pianists, you are taking one or maybe two programmes around the season. I think it's very difficult to make that decision of playing complex music from memory. It's stupid, it's psychological really, I think, because, I have played Schoenberg from memory and, in some ways, rhythmically it is not as complex, but harmonically it sure is. But, in terms of the text and balancing everything, clearly all the details he writes in the score, are very complex. Similarly, you know, just going back to Beethoven's *Hammerklavier*, the last movement of this sonata is as hard and unmemorable as anything I could think of from the last twenty five years. So, again, is a psychological thing a little bit. There is something I thought about quite a bit recently, particularly after I had this conversation with Unsuk Chin about playing her piano concerto from memory [laugh]. She did conceive it was less possible to do the piano concerto than the violin and cello [from memory], simply because they just have one line in their music and we have two lines and it's really a virtuoso concerto, but as I say, the notation is much cleaner than the *Etudes*, so really nine out of ten times you actually see that you can create a strong visual memory of it, which is the case of the notation in some of the *Etudes* until you have re-written them out.

V: In the pieces by Schoenberg, how long did it take to memorise?

AZ: Oh gosh [silence]. Well, I played all the pieces and recorded them actually.

V: Which pieces?

AZ: I played all piano pieces by Schoenberg. Not the concerto but all the solo pieces, and not the early sort of very Bhramsian pieces, but everything from Op. 11. So they were kind of in my fingers, but actually the first work of Schoenberg that I played from memory was the six little piano pieces when I was nineteen. They are less problematic, but it's the absorption of details that takes a long, long, long time to be really [absorbed]. And not just about absorbing the details, but digesting and presenting the results in an emotional sort of meaningful way. But I played Op. 19 quite a few times from memory. It is kind of moderately comfortable, but if you do ask me to play them from memory I probably couldn't, to be honest with you. But, Op. 11, particularly the first two pieces are more memorable, but then again Op. 23 is really tricky, but it's really orchestration, not as so much as Brahms in that sense, but Schoenberg he wrote so orchestrally for the piano, and that is the sort of the height of the problems in Op. 23, because there are things in Op. 23, the five pieces, that are really terrible piano writing, just so impractical and you just have to make decisions about how are you going to make clear what you are going to do about tempo. Are you are going to compromise the tempo he asks? But, I guess that when I first learn all the Schoenberg pieces I was asked to record this piano music with not really enough time to really, really, really learn them well enough, so I learnt them, I could play them, but there were certain moments, when I listen back to the recording, tjere are things that have a bit more sort of depth about them and there are other things that

just sound dreadful. I think, therefore, this is why the memorising process is tricky, because right in that sort of initial process of getting myself into the music, everything was in the surface, the absorption of the details of the pieces, you know. I knew I was going to record them, I knew I was going to record them from the score, so, even when I played Op. 19 from the first time from memory I had to work really hard, because I was trying to correct any bad habits I acquired when I first learnt them. I had to sort of eradicate and try to start fresh almost.

V: Is it really different to play with or without the score?

AZ: Yes,in some ways it can be. I have two analogies. The first, when you learn to drive you always have someone in the sit next to you, and usually they have control of themselves as well, so if you are about to do something stupid they will rescue you. So, that is great, you passed your test and then suddenly you are sitting in the car, by yourself, you don't have the security of a) someone there and b) someone that is going to control the car for you if you do something stupid. And the other analogy is with swimming. Some people learn with floats and when you take the floats away it's like, 'oh my God, can I do this? Can I still float?' And that's the difference [laugh]. Sometimes for me, between playing from the music or playing from memory, if I have done the work properly then when I take the floats away I am not drowning. If I haven't quite done it properly then I am going to wave around for a bit. Maybe I will find my balance in my feet but, you know, one day I might, one day I might not [laugh].

V: Now, let's change a little bit the subject. I would like to talk about skills. What skills do you think a performer should have in order to be able to perform contemporary music?

AZ: Oh, the same as in any other music [laugh]. People say to me when they open a score of contemporary music: 'Oh, I could never count that'. Even some of my professional colleagues say that. And I think, well, it's just crochets, quavers, semi-quavers. Sometimes you have slightly strange rhythmic groupings, but no one ever taught me how to play contemporary music. I never went to some special person, guru, that cast some spell over me to be able to play seven semiquavers in the time of five. I just worked it out. I don't have a mathematical brain at all. I think this is a problem of putting things in boxes. If I say to somebody that thinks, rhythm is a really tricky thing, this is contemporary music, they are going to say, 'oh I am not going to touch that'. If we say 'it's classical', they will say, 'ok I will look into that'. But we are talking about the same things. We are talking what we usually refer to irrational rhythms, for instance, and particularly in Finnissy, Ferneyhough. Sometimes super imposed irrational rhythms. [To perform them] your right hand is doing, let's say, 7 in the time of 5 and your left hand is doing 13 in the time of 6. Ok, I had this talk recently with some students, and I opened the page of a Chopin's *Nocturne* in which

they had to play, in the right hand, something like 11 quavers in the time of 7. There is no difference, but nobody questions it in Chopin. If you open so many pages in Beethoven, they are so complex rhythmically. For example, the slow movement of the *Hammerklavier*, it starts in 9/16 and then it progresses to sort of 18/32. Can you imagine in the early 19th century, what they must have though? My God! And we still struggle with that now. It is almost more complex than certain things that contemporary composers write. But because it is Beethoven you don't see it as complex, because it's from the classical period world. But it is really complex. And I think, for instance, with Finnissy, that you have to decide why is he writing like that? What is the spiritual artistic end product he is after? Finnissy's music was something that troubled me for a long time and then I listened to him playing the piano and read a lot about him and met him and worked with him and he is actually a lovely man, who loves playing romantic music and when he plays it he plays in a very romantic, old-fashioned romantic way. A lot of the sound of this music is quite romantic actually, as well, despite the rhythmic complexities. After a time I started to hear that it was almost like this very old fashioned recordings, old fashioned sort of style of playing, where you know the bass anticipates the melody a little bit. Sometimes you look at certain pieces of Liszt, where he splits things, and he just notes that the melody comes into after a demisemiquaver. That is all he is doing, really, he is just notating what a lot of pianists just naturally did in the early 20th century. Michael Finnissy is going a stage further of actually really notating it in this way, so the very romantic gestures. It is very hard to talk to Finnissy about his notation, but I did asked him one day, when we were working a particular piece, 'is this a sort of very romantic old-fashioned style of playing, you know, of anticipating the right hand with the bass?'And he didn't really say, he just smiled at me. So I think he would threw me out of the house if I have been completely wrong about that. But it is getting away from the idea of complexity. There are certain things that are so ferociously difficult rhythmically. But we have again that with Beethoven, you know, if we were able to play the last movement of Op. 111 and understand what is happening there, why did he wrote that way? Well, he did it to create that sense of struggle a little bit with the music, of something that doesn't want to feel completely easy. And I think, as I say, just as with anything else, with contemporary music, you have to understand, with the very best composers, and I believe these people we are talking about are the very best or amongst the very best, they do this for a reason. So, the labels are a big barrier, and that is why I say, I just think that people should be investigating music full stop and I don't just mean classical music as well, but across all genres and there is fantastic music and not so fantastic music, music you are drawn to and music that you are not so drawn to. And that is the beginning and end of it.

V: Do we have time for one more question?

AZ: Yes.

V: You have been working closely with composers. Do you think that collaboration influences in any way your preparation of a work?

AZ: Yes. It's an interesting question, actually, Vera. It depends on the composer. Some are very over controlling. They have an idea in their head of how they want their music to sound, in terms of timing of things, of tempo and nothing else will do. A composer I have in my mind at the moment is a real metronome junky as I call him. He will come to the rehearsal with his metronome, and if you are not absolutely on the nose with the metronome, metronome goes on and I find that inflexibility a little bit unattractive, I have to say. I had a similar experience with a composer who wrote a big set of piano pieces for me and what I was trying to do didn't fit exactly with his measurements, as it were, and he didn't seem very satisfied. I think it was Michael Tippett that said, you know, he brings his children, his music, his works into the world and then they have to defend from themselves after a time, once he has released these into the world, is for other people to bring interesting things to the table. Conversely, I remember working with a composer and bringing him a slightly off piece idea of the piece I was playing, which wasn't quite on the score, but he said to me, 'I didn't quite write it like that, but I really liked it'. So, you have to take the chance of doing and discussing this with the composers. The thing I love about both Unsuk Chin and David Lang, for instance, and Simon Holt, very much, is that they pre-shape the journey that you go on with the pieces. So, maybe the first time you play the pieces they are ok, but you know, some things work and some things don't work. But then, the next time they come and hear you play something is moved, something is changed, and I love working with people like that, that have that flexibility to see things differently and trust me. They still put me forward to play in festivals and to feature their music, because I think they know that I am there for the long core, I am not one of this sort of people that flips from piece to piece. As I say, there are many composers who I love working with, and I love their music and I am not saying I don't play other people's music, but I really work on playing their music a lot whenever I get the opportunity to. So, they know that I am going on a journey with the music and it is going to develop and keep growing and they are happy for that to happen, and they are happy to take the rough with the smooth. I am not so interested in composers that want you to be absolutely pristine and absolutely unbelievable from the very first performance, and if it's not quite there they don't want to know. I should say, playing contemporary music really has a profound effect on how I play old music. Particularly when it's brand new music and I am premiering it, I think one needs to think in that same way with traditional music, so much that, just imagine, it has just been written yesterday, and forget the whole performance tradition of one is suppose to do. Again, coming back to the Rachmaninoff concerto No. 2, as I said, I played it on Sunday and I played it in March, but before that I haven't played it for about ten years, actually. So, when I knew I was going to play it twice and that I was going to play again in the end of this month, I decided 'ok, it's time for me to really go back into it as if it was completely new', and I even bought a

new copy of it, so I wouldn't have any of my own markings or fingerings or anything. And something else I have talked to with a friend of mine about, as well, is that the performance tradition has build up to play these pieces as fast as possible, and when you look at his metronome markings, actually, people forget that the first movement of the Rachmaninoff concerto No. 2 is *Moderato*. It's not *Allegro con brio* or *furioso,* and successively the tempi gets faster and faster, and just before the return of the opening, before the recapitulation, it's sort of its fastest point. If you do that it's an amazing emotional sort of intensity that gets build up. Ok, some of the metronome markings are a little almost low side, rather strangely, actually, so in that case I would take the spirit that maybe he is sort of exaggerating the case, but he wants a sort of breath of tempo up to this point. The last movement is very quick, that is for sure, but even in the end of that, actually, is quite a held tempo compared to what we hear people do the whole way through the concerto. When somebody sends me their new piece that they have written for me and I am just giving the premier of it, I have to do all of this right from the beginning, because there is no history. I can't turn on Schnabel's recording, for instance, to have some point of reference. There is no point of reference. I would be the point of reference. So, I have to see what is on the page. As I say, it really makes me look fresh at the traditional music that I play in a very different way. Also thinking about sound, so much, because so many contemporary composers are very specific about pedaling, about degrees of pedal. Even composers like Debussy were very non-prescriptive about pedaling, also about degrees of pedaling, partly because of the instruments of the time didn't have a mechanism that could operate to that sensitivity. But there is a piece by John Adams, *Phrygian Gates*, which I have played a lot and this is one of those pieces very prescriptive about degrees of pedal and it really changed my whole view of playing Debussy, for instance. Realising how we can control and build up a resonance so much by using degrees of pedal, you can see that the degrees of pedal can control the orchestration, can help you sort of building up or decreasing orchestration in a piece. So, in that way, I learn such a lot from playing contemporary music that I was able to transfer it into the traditional repertoire.

V: Coming back to collaborations with living composer. In your meetings with the composers, what issues do you discuss with them?

AZ: Sometimes clarity of text, sometimes if the tempo is not really workable and you need the direction, I will ask. I try to have this clear idea in my head of how I see the journey of the piece, and I probably wouldn't talk before hand, I wouldn't ask them, just play and see what comes up, because sometimes you have these pre-conceived conversations, which slightly push you into a corner if you are not careful. Sometimes when they hear the music for the first time, and even if you do something slightly different at that tempo, balance, or dynamics, they end up liking a lot, even if they haven't done it before. So I think the conversations begin after you play, for me, anyway. I think these conversations have very often to do with pacing up proportions,

but I think what I like doing is to play a piece a few times and then go back and work with the composers again a bit more and I feel I have learned it a bit more, actually.

V: Do you discuss memorisation with them?

AZ: No, never comes up. Never an issue. I think they would be happy either way.

V: Is there anything else you would like to say?

AZ: No, I think I said it all [laugh]

V: Thank you so much for this amazing interview.

8.3 INTERVIEW TRANSCRIPT CHRISTOS TRIANTAFILLOU

V: First of all I would like to thank you very much for your collaboration in my project. I am a doctoral student at the Royal College of Music. I am working with Haris Kittos, that's how I heard about you and I am working on the topic of musical memorisation, focusing on different styles of repertoire, namely contemporary music. I know that you have been playing contemporary music by Greek composers, right? Can you tell me a little bit more about that, so what composers do you include in your recitals?

CT: Ok. First of all Haris Kittos. I have with me his scores and maybe another time I can also bring you other scores from other composers, no problem. First of all this piece by Haris Kittos is based on extended techniques. Actually the five pieces I have here are from five Greek composers, all with different styles. These works don't have a connecion with each other. For example, Haris Kittos is based on extended techniques, Panaiotes Kokoras is another composer who is now in Texas and he composes spectral music, only with pedal. Dimitrios Bakas is cubist, another kind of work, more psychological. Gikas is from the *New Complexity*. Bakas, Kikas and Georges are actually all related to the new complexity, but they have three different styles of *New Complexity*. For example, Gikas is more like surrealist. Georges is more on the line of Xenakis, relates to how Xenakis composes his works. Dimitrios Bakas is more psychological, cubism, a completly different thing. Did I forget someone? Ah, I was mentioning the five styles. For example, Haris Kittos is extended techniques, Dimitrios Bakas, Gikas and Georges is *New Complexity*, but three different styles of complexity. Kokoras is spectral. This is very important. And Kyriakides is minimal.

V: Great, so you have experience with several styles of contemporary repertoire.

CT: Yes, I think these five composers are like a miniature example of the contemporary world. For example, if you want to explore each one for his style, this is a huge challenge. Of course it's not easy, because you have totally different characters, personalities, previous influences and you should incorporate all of this in the music.

V: Do you have any preference for any style of contemporary repertoire?

CT: Look, I see all of this as one block and this block is special for me. I don't have a favorite one. I actually performed these pieces in a concert in Goldsmith as one single line. The program had a beginning, middle and end. It doesn't matter if you are playing five different styles, they are a whole. In this recital, everything was united as a whole. Actually this recital was special. Have you been at the Goldsmith town hall? I went there and I saw the environment. It wasn't adequate for contemporary music, it was more for classical, 19th century or 20th century music. And I did one experiment with my wife and we turned out the lights. After experimenting all types of options I felt that the most suitable option was to play with the lights out, fully.

V: This is very interesting. We have to also think about the performance environment. But do you also play classical music? I mean traditional, romantic repertoire?

CT: Of course. We can't separate both things, they are both important. Actually I think that contemporary music should be incorporated early. Dimitrios Bakas, for example, wrote a piece for children, with extended techniques, and by playing this music, children start familiarising with the contemporary sound and the techniques. In schools you have one gap between classical and contemporary. There are very few schools which take contemporary projects very seriously, or pay attention to these things.

V: Yes, before we move to that topic I would like to ask you some questions about memorisation. Do you memorise all your repertoire?

CT: Everything.

V: Everything?

CT: Everything and since always [laugh].

V: Can I ask you why? Why do you play from memory?

CT: Yes, first of all, everything that I will say now is my personal opinion and personal experience, ok?

V: Yes

CT: First of all, I prefer to play music in general without anything in front of my face. I don't know why, I just simply prefer. Then, also because I was led to do it in the classical world, to learn things by heart. But actually, personally, I never felt forced to do it, I memorise because I like to do it. After some time it actually began acquiring a different meaning to myself. One of the main reasons for this is that I want to have everything in my mind, because when I have everything in my mind I have schemata, I have geometry, I have everything, ok? This and also because after some time you can work with your inner ear. If you can do this [play from memory], you can see every piece in your head. And actually this is interesting for pieces that you are premiering for the first time. This is different because if we are performing a classical piece, for example by Bach, we listen to the piece, we know how to perform it. But what happens when there is no recording available? You don't have anything, and how do you start playing? I don't think anybody talks about this, ever. How can you solve this?

V: Yes, of course. So now I would like to focus on the actual process of preparing for performance. So, first, on the learning process.

CT: If you can read the piece and hear it in your head then it is easy. The problem is how do you arrive to that stage. Step by step, and imagining what I think the piece will become. It's like acting, the performance and you need to think and imagine what you will do on stage.

V: When you start learning a piece, for example a contemporary piece, what do you do?

CT: First of all, I read the score only with my eyes. Because one thing that attracts me in contemporary music is geometry. And these composers have in their pieces total geometry. So first of all I need to see this scheme. I don't care what the notes are, but I try to see one scheme in general, just superficially. And actually, to tell you the truth, my approach is usually just in the first page. I don't want to go further, because it's already boring.

V: Yes, that is very interesting. So, can you always find geometry in contemporary pieces?

CT: Always, but this geometry has something special. I am talking about piano music. You can use whatever you want in this music and the geometry is one thing for contemporary pieces and other thing for more classical repertoire. In contemporary music, you also have how you possibily move the hands, how to perform movements of extended tecniques, for instance. Well, my opinion about learning by heart is

related to the material you are being given, a little bit, sort to speak, and it starts step by step. In the beginning I am going to refer to the first years of studies when you must learn sort of note by note, of course. There is no other knowledge, to be honest, it's just notes and rhythm, but the more you learn classical music theory and harmony, all those forms and everything else in the music come together and becomes a scheme in itself. Of course note by note is also important, you should watch every single detail, but first you have this scheme, this model of the piece.

V: How did you learn how to recognize these forms and this geometry? Because, as you say, we are not trained to do that in contemporary music, but you are saying you can do that. How did you get there?

CT: I think we are all trained the same way. The important thing is where you are paying attention to. One problem of our times is that we have composers and pianists. This is very bad for us. Currently pianists don't have the time or need maybe to train in composition and composers don't have the time or need to train an instrument. This is a very important issue. For example, the last pianist-composers who played their own works were the russians, for example Stravinsky, Prokofiev, Scriabin. After them, the new composers after Xenakis, after Stravinsky in general, don't play their works. And this is one problem. It doesn't matter what you can do in your mind if you can't apply it in practice. I am now thinking about other situation, about the importance of understanding the psychology of the composer, ok? For example, I played a piece by Kokoras, a spectral piece, using one pedal from beginning to end. One day I realised the schema, the geometry of the hands, based on guitar playing. The writing was based on how guitarists play, not on how pianists play. So it's important to understand how they play. In guitar you only use eight fingers ok? On the piano you use ten fingers. It was amazing to realise this!

V: So you are saying that, in this case, you were understanding geometry from the way you were playing? Based on guitar playing?

CT: It’s one unit all of this. The parts, the mind, the notes, the techniques, the extended techniques. All of this is one piece, understand? You have for example nine parts, but then you have to think in one unit, everything comes together, all of this. For example you have nine parts, but you should think about that in the end as one unit.

V: Very interesting. So, when you are memorising, what are your strategies, what do you think about when you are trying to memorise? For example in that specific piece?

CT: Believe me, in that case, memorising I think it was the main experiment of my life! I went through different stages, because it is not very simple. One important thing is that I read one piece as I read a book, and this is one way of learning the

piece, imagining the piece. You just simply go through the score, see different parts here and there, just how you read a book. I remember, for example with a Prelude and Fugue by J.S. Bach, to sing it in my head, and imagining playing it, seeing myself playing. That is the first strategy. In contemporary music, after learning all the notes, everything, I have it in my mind like I see it, you know? This guides you in that way. You can see it. Now, coming back to what we talked about before about pianists and composers, you don't need to become a composer, but you should use theoretical knowledge, poliphony, harmony, counterpoint, everything you play, a fuga, a sonata, a concerto, you should also use that knowledge. In that case, in the beginning this is what you pay attention to. And this actually helps to play by heart. Everything is connected, body, theory, includes everything.

V: But, can I ask you, do you have experience with composition? Do you compose?

CT: Of course, me and Amelia [his wife]. But we are not composers, we compose for our personal sake. I have written one piece ten years ago, but just for myself. In conclusion, in my opinion, we should teach children the compositional side. Doesn't matter if they are going to be composers or pianists, ok? We must learn this and encourage this.

V: For sure. Now, I am really interested in knowing a little bit more about how you memorise, because it's incredible someone who memorises everything. Can I ask you specific examples. For example, you mentioned that you played minimalist music, do you memorise this music the same way as you mentioned before?

CT: With Kyriakides it was easier, because it is minimal and it repeats all the time. And I memorised the notes, because it is one pattern only, after I learned this the hands did the job, let's say, because the hands don't have differences in positions. Doesn't change much in the piano position. It's very easy I think to memorise.

V: Yes, that is very interesting. And, for example, Haris Kittos' pieces, just to have different examples. How did you approach those pieces?

CT: Kittos? Ok, if I remember the score correctly, because I didn't have time to see it, also a totally different approach, because in this piece you have a big combination between the extended techniques and the keyboard, ok? It's very geometrical, it has geometry and I mean geometry of the moves of the hands, how you move, how you play. But first of all my approach was to find the metric. I place one note there and I write on the score where the pulse is, and I actually begin memorising at the same time, while learning the notes and gestures. For example, while I am reading that, I am already imagining the movement, what is going to happen. In contemporary music you should feel that the body is part of the piece, the approach is different and the feeling. Also the sound. Sometimes, when we are learning, we forget the most

important thing, the sound. Everything happens for the resulting sound and each composer has a different sound, Kittos one sound, Bakas a different sound, Kokoras different sound.

V: Exactly, these examples are fantastic! This is what I want to know, different experiences of memorising different pieces. So, for example, you also said that you played spectral pieces, or new complexity. So, what is the approach in a piece of new complexity, for example?

CT: For the *New Complexity* I was fortunate to have played three different kinds of complexity. I am fortunate because of what I said before, because you have the opportunity to interact with all types of repertoire, all contemporary movements of our times. For this reason, I think that the piece with extended techniques by Haris Kittos speaks for itself. The piece by Kokoras the same. Each piece is a new complexity and this is really complex, because we have three different complexities and I approach them in totally different ways. For example, the most difficult of the three, from my personal point of view, was Dmitris Bakas, not only from the complex writing, but even more from the psychological experience, how one breaths, how one moves, how one stays in the piano, everything. The feeling, the tension. For example, in the Gikas is a total different approach because it's surrealist and this is completely different, for example what I said before about my relationship with the music and how it relates to play by heart. With the Georges for me everything was more familiar, related to Xenakis, the sound was related and I think we should speak in this terms now, if we talk about expressing the music. For example, the sound of the extended techniques, the sound of the *New Complexity* of the Georges, of the Bakas or of the Kittos, or the sound of the minimal are unique. It's totally different than from compositors of the 20th century, for example.

V: Do you always think about sound?

CT: First of all I think about the sound, for whatever pieces you are learning the sound is special. In classical it has one specific application, but more specific now in contempoary music, the sound should be first. First of all we have the sound, because if I don't have the sound, the three kind of complexities will sound the same. It doesn't matter if they have totally different sound or feeling or philosophical ideas. Everything is in the sound.

V: Yes, very interesting.

CT: There is no exception of this rule and this is important also for education of classical musicians. One thing that is very important for me, my personal rule, is that I don't want to listen to the piece before I perform it. This is my personal opinion. The piece of the Haris I think, it was one performance for the Kokoras piece and for the

Gikas, but I don’t listen to it before. I learn the scores personally before meeting with the composer and than I express my ideas. You create this connection with the composer without seeing him. You can actually have a connection with the composer two hundered years ago. A piece is not just a piece, it's a story itself.

V: Yes. Now, about the moment of the performance, when you are playing on stage, what do you think when you are playing from memory?

CT: [laugh] Ok, ok [laugh]. Basically I don’t think. Yes, truly. I have only the schema, I have only the sound, the sound that I want to express at that time with that piece. I don' think, I simply listen to the sound, I listen to myself like I am in the audience. I let myself and enjoy all of this. And this is why also I don't play very often. I need to feel that I am saying something, I need to keep the passion for example for 30 minutes, keep it interesting for 40 minutes. I need to feel complete.

V: Yes, yes, very interesting. And do you have any story of memory slips?

CT: Of course, but not for many many, years now, of course. But when we are kids we have them and we learn from them. We need to train for this. And how do we build this? How can we learn to play by heart? It can't be a torture. When people ask me, how do you play by heart? How can you do it? I think that the process does not involve only the piano, or the piece, or the music, it involves a lot the familiarity with the resulting sound. The knowledge of the sound that one actually acquires with past experiences. Also is result of experience, even learning from others experiences. Why did that happened for example to Richter, why did he stopped playing by heart? It's intriguing. Why? Something happended to him that you can only understand by being there and live daily experiences with the pieces, whatever pieces you have programmed for one recital. And of course all this depends on the performance effect also. For example my decision of playing with the lights off in the Goldsmith concert. I said to my friend and organizer Dimitirs Exarhos to tell the audience to don't clap between the pieces, no applause. Because I want that silence, so I can feel that me and te music become one.

V: Of course. I don’t want to take much more of your time, so one last topic, if that’s ok, one last question. Which skills do you think a pianist should have to be able to play contemporary music?

CT: Ok, for me personally, this is very personal. You need to have general knowledge, first of all. Because in music you are not only just a pianist, no! We shouldn't just be doing one thing only, because everyhing is connected. For example, now they want contemporary specialists, contemporary pianists. But the contemporary specialist must have more open mind, must include all styles of music,

understand music and not only music, philosphy, quantum physic, everything is sound. We should have this general knowledge to perform the pieces, ok?

V: Yes, very interesting. Ok, So, for me I am very happy with the interview. It was amazing, thank you so much! Is there anything you would like to add to this?

CT: I don't know. We could meet again and I could show you the scores in more detail.

V: *Yes, of course*

Interview- second part

CT: Ok, so today I brought you some pieces. First of all, I have the Haris Kittos, Arthos the Dimitris' *Logos dixos ennoies*, *God good luck* by Kyriakidis, I have the Nicolas Tzortzis, *L'accrochage du menteur*. I have the Gikas, *Kondor Silence*. For Kokoras, *The Bold Ridge Apex*. From Dimitrios Bakas, this is for two pianos and each one very special in my opinion. I played the two pianos and recorded them myself.

V: Yes, did you play from memory that one?

CT: Yes, all by heart the second piano and the first.

V: Wow! Impressive.

CT: I will explain you. Ok, with what do you want to begin?

V: As you prefer, for me is the same.

CT: Let's begin with this, with my friend Haris. Well, one thing I forgot to say last time, I think that in general, in my conclusion, in my mind this piece is geometry of the movements, ok? How the movements express what is in the piece, which brings you, guides you, basically it's what the composition translates in practical ways, by performing it, ok? For example, how can one pianist translate this piece, the *Arthros*, for example? I forgot to tell you one good technique, which is to write every piece, not specifically contemporary. This is one method. Now, I forgot to tell you something, let's call it techniques, one good technique to memorise that we actually learn when we are kids is to write every piece, not especially contemporary. What do I mean with this? I mean to write what you hear, the accustic dictation that you learn in school. And sometimes I do this as an exercise. One way is to write the piece and the other is to try to write like the composer, not to copy him, but to try to write like him.

V: I understand, to experiment on their language.

CT: Yes, for example, I play this piece and I try to write like the composer, doesn't matter which composer. It is easier to begin with classical forms. With those pieces, if you do this exercise after some time, you become used to its writing and when you play it is easier, even to sight-read. This is one way of memorising away from the piano. I know it's heavy work, but one good way to actually accelerate the memory process, to be ready for every piece, and the best way is to begin with classical pieces. So, if you are doing something contemporary and you get used to this, somehow you can listen in your mind to the music, the geometry, because you are used to it, understand? I will speak a little bit about this before we talk abou Kitto's piece and before I explain what I mean by geometry in contemporary music. But all of this is one chain and applies to classical, and contemporary. This is very important for me and to people in general, to understand that contemporary music is one continuum from classical music. It is not something abtract, like one day Xenakis, Bakas, Haris woke up and wrote five notes. No, it's not like this, they had their own previous auditive experiences, you know? My training in Bucharest is a good example, because they had theory lessons in the university, not just performance and this is very important, because you have to know the pieces. This is very important, you need to practice solfege, to keep the pulse with one hand, sing the rhythm and tap a completely different rhythm with the other hand, while singing the melody at the same time.

V: Yes, I had to do the same.

CT: Ok, it’s a perfect system, because the exercise of listening to a melody and write everything out in five minutes, this is very good. But how do we arrive here? I really think this is very helpful.

V: But do you do these exercises in contemporary pieces or only in tonal pieces?

CT: In contemporary pieces the method changes a little bit, because the general theory doesn't have direct connection with the composers. But still writing something brings you closer somehow to the composer's mind, ok? You can be more attached to him, to be closer to him, you even feel you write like him. Doesn't matter who the composer is, understand?

V: Yes, yes.

CT: In contemporary music, one very big and important issue related to this is tempo. For example, you should take the metronome alone and feel the different tempos, 120, and feel the beat [sang the rhyhm]. The 56 is this, then 31 is this, ok? This way you

can feel the tempo inside you, you should become yourself a metronome when you deal with contemporary music.

V: How do you memorise the tempos? How do you know how much is 60, how do you know this from memory?

CT: It's very simple actually. For example, if you are doing one piece and you listen to it, you automatically memorise this in your mind and you remember that the tempo of that piece was 120 and so on and with time you become used to it, because tempo is a very big issue in contemporary music. You need to explore this before. And when you are trying to understand geometry the metronome is very important, you need to feel the tempo. And because of this I try to write on the piece and understand the pulse and tempo changes and write the beat on the score. Now let me give you an example, in Haris Kitto's piece, Arthros. In terms of rhythmic structure he has something like 1,2,3,4 - 1,2,3,4 - 1-2, and so on. Ok, and this goes on for the entire piece. And this 1,2,3,4 continues throughout the piece, regardless of if he changes the meters, it doesn't matter, the 1,2,3,4 remains, understand? And you see this in other pieces. Now here in Kittos we begin, for example, we start the first line and he writes 46 and you can subdivide into quavers, 92. And you start slower and build until you arrive to real 46, understand?

V: Yes

CT: For example, here you begin and you start with this schemata in your mind, ok? And you should always follow this schema and stay inside it following the tempo 46, or 92 as you prefer. After this, of course, at the same time, you begin with the *pianissimo* and follow every single indication. You have to learn all these indications, you don't just start with the notes or rhythms and then the rest. No! You need to follow everything he writes, the *senza pedal*, *una corda, tre corde* and so on. For example, when you learn one meter you learn with everything in. Not separate. And here is when the geometry comes in. For example this beat here, you learn it with all the indications, up and down. Maybe this seems that is taking your time, but actually it takes time to learn, but actually you are accelarating the process, because the mind memorises everything. For example, when I begin, I begin with the first page, ok? When I write and learn the second page the first page is already in tempo, and so on, and so on.

V: Yes, like building a puzzle.

CT: Exactly, like divide it in parts and knowing then after this comes the next, and the next until everything comes together. Because when you arrive to the last page you have that feeling that you have already learned the rest amost in tempo and you actually have everything in your memory, note by note, accurately. And here this

piece by Haris is very difficult, because you have clusters here, you have movements that are going to happen not in a fast tempo, but you need to move accurately understand? You have so many moves, and he chooses this tempo slow, but it's not slow because he moves and everything you are doing at the time, that *sforzando*, the open chord, you have to place the pedal after this, you need to take the pedal exactly where he says. This is a very important issue. And you must understand and think about everything. For example, the *accelerand*o from here, how do you build it from the beginning? In the beginning you don't do it all *accelerando*, but you built it in small steps. Do you see the score?

V: Yes, just the score itself is a work of art .

CT: Yes, it's true. You know, that is something else, because the job that took this person to write like this, you should admire this and as a pianist respect it and make sure you bring everything writen on the score.

V: Yes, definetly. Can you just try remember what was the first thing you did when you started learning that piece?

CT: The first thing I did was to write on the score 1,2,3,4- 1,2,3,4 and I only started after doing this. Because I should have this in my mind before I start, understand? And how can I control this, because we also have rests, not just notes. We need to think about these spaces, and silence is difficult, even in other pieces. If I don't pay attention to the rests I loose the game, understand? The first thing is to understand how the composer sees the geometry, but it's also personal how you see the music in general, how you see that geometry. Now a different example, let's move on to Bakas, the piece *Logos dixos ennoies* by Dimitrios Bakas. A very difficult piece, which is different then Haris because the tempo marks are open for the performer, see? [showed the score]. Ok, he writes everything he wants there, you will see. Look at this score.

V: He is very specific about the rhythmic structure.

CT: Here is another problem. The composer gives you the basis, the notes, beats, but for the pianist is difficult to improvise the tempo, because he writes that indication on p. 2 of 65, crochet 95 after. Of course first of all you play how he wants. Respecting in the beginning this 60, if I am also trying to think that I am improvising the tempo this is difficult for the pianist. So I begin by doing my geometry with the tempos. The piece is psychological cubism, it's very psychological. Look now, let's come back again to the beginning. If you are tired tell me, ok?

V: No, no, no, perfect.

CT: Here is the first paragraph. He has three paragraphs, because he was inspired by one psychologist of our times, I don't remember the name now. And he was trying o express like schizophrenia. Look, now, this is very important. I don't know you can see. This is like an appoggiatura?

V: Is this your annotation or the composer?

CT: Wait, wait. It's from both of us, together. After he listened to the piece, we collaborated together. That's important now to say that in this piece, is the pause, because it's one pause in the beginning and the piece then beginnis (presents dramatically), is this move with your body, you feel it. Everything is acting here for the performer, kind of acting. And what you see written here is that when you listen to the piece you think it's better to play it like this. I decided that the initial pose will be this and actually with the composer we changed it. Ah, very good here this example. When he writes here four second pause, can you see it?

V: Yes

CT: Four seconds. This is not one ordinary silence, all of this [exemplified the movement]. Understand what I say?

V: Yes, the gesture is part of the music.

CT: Of course, when you do this you demonstrate this to the audience, you trasmit the idea, let's say with this energetic silence, I can trasmit the meaning of the silence, understand? Now an issue with this piece, look, I will show you, for example, how do you play the first meter? Look what he writes, ok? This is me, I am doing slow, slow and you can see he writes 7 to 6. This is the complex, complex, complex, complexity, let's say. It's not the simple complexity, it's the psychological complexity. The composer creates his personal expressivity and is difficult now, because for example you have to play, you have one meter 5/8 and then inside a 7 to 6 and 4 to 4. How do you do that in 5/8?

V: Yes, how did you figured out the rhythm there?

CT: To understand this you need to have knowledge of what is happening in science today, with physics, with theory of everything, and so on. Because we live in the 21st century and the composers are inspired by what is around them, science, everything. This is why all contemporary pianists must have in mind all of this. But this piece began my adventure with the contemporary world somehow. The first time when he called me to his house, because as I said before I first play alone and only after I meet the composer. And he asked me to go to his house (we are friends of course, friends since we were kids) and he told me 'I have one work for you, I have several works but

I like this one personally'. The first thing I did when he opened the score, I sat on the piano and played and ask 'do you want it like this?'. He told me 'it's ok' and I said 'ok, so leave me and we speak after one month'. This is my first reaction, nothing else, and afer we did the analyses, understand?

V: Yes.

CT: Ok, now we speak about complexity, let's say in the Panos Gikas, another kind of complexity, ok? Let's say, this is surreal complexity, surrealism. Look now the Panos Gikas score [showed the score]. Here the interesting part. Look, this, 7 to 8. It has 8/8, look, and you must play like 7 [laugh]. This is another kind of complexity, from my personal point of view is simpler. Of course nothing is simple. But with this I do exactly the same work I told you before, with the schemata...1,2,3, see? Exactly what I did with Haris, but not with Dimitrios, because the piece is like this, understand? You always begin with the logic of the composer, understand? This is surreal complexity, ok? I's not simple, of course, you have many things happening at the same time, and here the same thing, 7 to 6. Here we have this forte, forte [exemplified]...here another sound, here the meaning for the three *fortes* is different from how you would do it for Dimitris or the spectral of Kokoras. We have to respect the sound. Ok, now another kind of complexity from Tzortzis. The first kind of complexity. This reminds somehow the Xenakis writing and the Xenakis complexity let's say, because he loved Xenakis, understand? The Tzortzis is one different person, doesn't matter if they have the same teacher, all three of them, Bakas, Tzortzis and Gikas, but it's totally different here. It's more like Xenakis, ok? Ok, now I leave this and let's talk about minimalism, Kyriakides. It's this piece, *God good luck*. It's very important for you to see the title and understand its meaning, what the composer wants to say. This is what I told you before, the version for the piano. Here now, is simply again with the beats, but it's very beautiful, because of the space, the sound space. And it's the same motif all of this. This is minimalist. You have similar pattern to remember, the hands. And so on, so on. Here I think 1+2+. I divide it like this, I count. Ah, also he writes here *'Should be played as fluid as possible,with the aim on letting the harmonies resonate…'*, ok? How can you do this? Instead of thinking in 150 think in 75, understand? So play like this with the metronome

V: Yes.

CT: And here of course with the spaces I wrote the rhythmic counting to remember. We should do this job and also to play everything, everything, everything perfect and after you just forget about this and start listening, but only if you have everything. But even with the rhythm, thinking in 75 instead of 150, of course one can express how you want. I see it like this, others can see it differently.

V: Yes. So, how did you do to memorise all of this? Because you said the patterns are quite similar, right?

CT: Ah, note by note course. But here it's easier for the hand to remember the patterns.

V: Yes. So, in the other pieces, Haris and the others you didn't memorise patterns? In the others.

CT: I memorise patterns in everything I play, but first of all I memorise every note. I sing, I stay and sing or stay like this now, if I want to play, the day before I only do this, I don't play at all, I sing in my mind of course. Because by the time I read the notes I already know it and this is just simply to refresh and after that is to let your hands do it. But first we should memorise the notes, everything written by the composer and after having interiorized everything we need to stop dividing it and think as one unit. The hands, the movement of the hands, the movement of the piece, the geometry, all of that comes together. This is the difficult part for the pianist, to assemble everything. If you are able to assemble everything than it's easy and you can control, you can do how fast you want, how slow you want, do you understand?

V: Yes.

CT: And you always have to play with the tempo in mind. Ok, you will see here in some piece is very easy for the hands to memorise, but it's difficult to imagine the sound and you keep this feeling, that crystal, what he wants there. Here for example the sound is clearer, you almost have this metalic sound...and everything gets unified, you and the piece, and the piano, everything becomes together as one sound unit somehow. This is the difficulty of that piece, because it's very easy to confuse with impressionism, especially that piece, is really easy. It's very easy to compare it with the music of Ravel or Debussy. It's very tricky this piece in that way. For this reason I think the composer is very intelligent in using the pattern, it's very intelligent thinking to have the pattern in the hand and then you just control in the mind the sound. This is why I need to keep in my mind the sound I had in the beginning, the sound I have in the middle, the sound I have in the end. This means that you should focus on the sound and imagine, if you don't play by heart, it's very difficult to hear the sound. I think it's necessary in this type of music to know the notes by heart, because you need to focus totally on other things rather than notes. For example, in the piece by Haris [Kittos], you need to focus on the sound and movement clusters, in the Dimitris [Bakas] you must have in your mind the sound from the first measure to the last. Yes, and here in the final you need to let the sound resonate, to delay the sound. You don't have any indiciation, you just need to finish the line. This means that you need to control the sound.

V: So, I am seeing numbers in this score, what to they mean?

CT: Just simply the beats.

V: Yes. Can I ask you, how do you divide your study?

CT: I set one goal every time when I start practising. For example, I say 'today I will learn this page'. I don't care how many times. Now because I am more familiar I take less time to learn, in 1, 2 hours. When I have several pieces to learn at the same time, what I do is for example I begin the first page of the Haris and today I will learn this. Tomorrow I learn the first page of another piece and the time I spent I cant explain, that depends on the inspiration, because maybe I stay in one day and learn three pages of the Haris, because I like it, or leave it for two three days or four and doing something else. But I work in my mind, I mean I live it in the sense that I don't play or look at the score, but I imagine in my head. I imagine the concert, the composer, the people, everything I will play, it's like I am in the concert. This I think is a very important issue. This is very important. In my study is like I am stydying everything like it's my last breath on earth.

V: Do you study like this all the time or near the performance?

CT: When I study yes, now I forgot everything, but I know it's only one month to remember again. After I leave it I forget everything, now I have to play in 2 years, I don't know it, but if I have to play it an month I can do it. But after the recital I leave everything, I have left my knowledge. Of course I won't forget, but I stop thinking about it.

V: Yes, yes, I understand. I have felt the same…

CT: I think this is the best way of doing it. You should leave the pieces and work on them later to refresh your ideas. To see how you react to the same piece after the experience. You will never play the same. When I study after I forget everything completely, I don't remember. I remember the tempo, I remember what it is but I just don't care about it, I am not paying attention to it anymore.

V: Yes, Yes.

CT: After you learn it you leave it to grow.

V: So you mean leaving the piece and then playing it again and that it's what you are saying, right?

CT: I learn the piece, everything in the piece and after I forgot what I learned. When, for example, I don't have the need to play it. But if I have to I would say I would only need a month, a month and a half. Because all the work is still there, you also trust in yourself, I think, in that way...

V: But for example if I asked you now to play Haris's piece in the piano right now. Could you play it? Could you remember?

CT: Now I remember only the beginning. I only remember the beginning for all the pieces in the end [laugh]. I can only play the beginning, but after two weeks I can play the rest. But I only remember the first measures for each one...and actually now I don' remember anythig because I don't want to. Ok, let's continue a little bit with a piece by Kokoras, *Bold Ridge Apex*. Ok, this one is written for Ermis Theodorakis, of course he had a recording but as I told you before I prefer not to listen to another aural model, I don't want my opinion to be influenced. I want to have my own conception, my thoughts need to be clear, understand? I don't want to have anything influencing me. Ok, and this is the same thing, this is spectral, one pedal from the beginning. Can you see it?

V: Yes, it says 'No Pedal until next change'.

CT: Yes, and this is for the whole piece, ok? It's the same situation with the beats and all we have talked about. So he writes in 144, of course it's 72, ok? It's better to think like this. The way I found to play with this piece, I told you before, and of course I spoke with Kokoras, was to play like a guitarist, with the fingers like a guitarist. I thought about a particular guitar player and I told Kokoras (not Dimitrios - in here I think he meant the musicologue Dimitris Exarhos, if you wish to bring it in that way, about Kokoras's piece) and he said 'Yes, it's very beautiful that you can see somebody here. If you can trasmit his work, eveything he is feeling'. And this is the intelligence of the composer. You understand him and you have a different connection, you can see even how he sees its, understand?

V: Yes, of course. Thank you so much Christos for this amazing and very rich interview. I don't know if you would like to add anything else.

CT: No, I think for now I said it all. We can keep in touch.

V: Thank you very much!

8.4 INTERVIEW TRANSCRIPT CHRISTOPHER GODDARD

V:First of all I would like to thank you very much for your collaboration in my project. I am a doctoral student at the Royal College of Music and I am working on the topic of memorisation in specific styles of repertoire. Do you have any questions before we start the interview?

CG: Before we start, I have to say that most of my work has been collaborative in major. Because as a composer I think it is very valuable to be working with other musicians and I need actually to see the score to follow other parts, so you probably found my Boulez video, this is probably how you found me, so we can talk about that. That was a very unique experience and I can talk about the specific things that came about learning and memorising that programme, but I can't speak from a large experience of learning and memorising contemporary music, so I hope that you will take that as given and I can speak about that particular experience and maybe a few others, just so you know about that.

V: Yes, but just these examples will be very useful. So, can you tell me, before we start, a little bit more about the repertoire you have played? Not only contemporary, but all repertoire that you have played as a solo pianist?

CG: Yes, sure. I did a degree in contemporary music at the Manhattan School of Music. There is a special programme there for contemporary music, which like I said is focused on collaborative music, so large ensemble, small ensemble and solo repertoire, of course. I didn't approach the contemporary music landscape from a vacuum. I was very happily well in classical music, as expected, and as you probably were as well. So, I grew up learning Bach, Brahms and Schumann, Rachmaninoff, but I looked at Boulez's music obviously at a certain time. That was a very informative time for me. And also Schoenberg, we played *Pierre Lunaire*. I actually played the Op. 23, very transformative for me as well. But, I suppose for me it was the ability to support and to be curious about the music of my peers. It is really not about one particular body of contemporary repertoire, American or European, or non-western, it's more about performing the music of my peers, which I have done a lot of, again, in solo settings and in chamber ensembles settings. I lived in New York, where I was very active and, as you know, this city is a melting pot of a lot of different people, a lot of different types of music. So as a performer I felt that it was my job to me omnivorous and to pursue these different things because it was a vehicle to explore different creative voices and now they help me as a composer. So, there is not one singular sort of area of interest, it was the music of literally our time, not 20th century, you know, mid-century, 20th century music, it was about the music of people that I was curious about.

V: Do you play your repertoire from memory?

CG: Do I play all my repertoire?

V: Yes. Which repertoire do you play from memory? Which one you do play with the score?

CG: I would say that I generally do not play ensemble music from memory, because as a pianist, usually you are the only person with the full score. So, you have the sort of role as a conductor, almost, and almost like a composer embassador. So, that is by design, I think. And there are certain cases, for instance I played some of the *Pierre Lunaire* from memory and that was for a dramatic effect, because there was some staging involved. But, in that case, I am not doctrinaire about playing from memory or not and, of course, as a pianist, we are, you know, we are glued to our piano bench, we don't have the same sort of freedom of movement that most other instruments do. Obviously, for example cellists have to sit, but you have other instruments that can move and can be much more demonstrative in their music making. So, your original question was what other music have I memorised?

V: Yes.

CG: So I performed a recital featuring the Boulez's *Sonata No. 2*, Schoenberg's *Kalvierstüch*. I also performed the *Cinco variazone* by Berio around that time. Both of the other solo music that I tend to play is music of my contemporary composers that I collaborate with. In that case, usually, as you probably know, there are usually changes and things that evolve as you work on a piece. It is always evolving and you have to sort of react to what is happening. So I don't have any other ambiguous projects that feature memorisation.

V: I know that you also played Unsuk Chin Etudes. Did you memorise those?

CG: I don't think I have memorised those. I just played the first one and the last one. That was on a very short notice. So, it was very atypical, you know those pieces. They were pieces that I think that, if I have had a little bit more time, I could have memorised them and I could have added something to the music for sure, but it wasn't in that case.

V: And your own works? Do you play them from memory?

CG: I have actually never written a solo piece for piano [laugh]. And that is not by accident. I find it uniquely challenging for all aspects, to do that, so I can't say that I have. I haven't play my own music from memory, again just because it has always been chamber music. I have a few performances coming up of a piano piece, that is challenging. It could be memorised, but there is so much there that I would have to

read all parts. I would loose more from memorise it, because it is so much information. So, not yet, but some day I will write a piano piece and I will probably memorise it.

V: So you spoke a little bit about this, but can you give me some more detail on why you decided to memorise or not? The reasons informing your decisions of playing from memory?

CG: Sure. Let me isolate that concert. I am not sure if the recordings are online, but I played three things. I had a piece of my own which is a chamber piece I did not memorise, I opened with the Schoenberg's Op. 23, *Kalvierstüch*. Do you know those pieces?

V: Yes.

CG: And then Boulez's Sonata No. 2. I played from memory the Schoenberg and the Boulez and I would say that my reasons for playing both of those from memory were entirely different. I talk to pianists all the time, people that are doctoral students at McGuill, in my home town. Some of them are sort of creative thinkers. They are always assaulting this idea of memory, this sort of dogmatic approach to memory and how valuable. And specially when this people start to, like yourself, start to actually explore contemporary music, it's a given that it is not required [to perform from memory]. And if we use this sort of experimental approach to contemporary music, why can't we import that into classical music? So, for the Schoenberg, of course, this is one sort of piece that can be approached as a proto-serial piece, especially the *Waltz*, of course. But is also very expressive and it is very much into sort of Brahmsian, *Klavierstück* tradition, so you can approach from either side. I have chose to approach from the more expressive, dramatic world, and for that I thought that to do it from memory would have been a means of liberating myself from the very precise details and open myself to be expressive with the piece. Perhaps at first, this doesn't imply that sort of interpretation, just because of all the sort of very finesse rhythm and articulation. I had colleagues who had played those pieces and have sort of being reprimented by their superiors because they don't know the piece, and they say, 'why are you taking all these chances with it?' And 'you are being too expressive with that', and I think that is actually totally inappropriate with that music'. If you can communicate the details, while also creating a sense of again, romantic, expressivity, that is important. That was my motivation for playing that from memory. It certainly wasn't a piece that I just learnt and all the sudden had memorised. I had to make the extra effort of doing that. Whereas the Boulez was a totally different experience. The Boulez, I did not set out to memorise by any means. That piece was something that I learned, I didn't have any experience and it was by far the most complex piece that I have ever played. So, I set out just to learn it and I set out just to learn one movement and see how it came and, eventually, the movements became together. But I spent so

much time with the piece that eventually I just had it memorised. So, I just sort of woke up one day and I thought. I don't even need the score for this anymore. So, the funny thing is that if I would do the same project again, with comparably, similar pieces, maybe also with Stockausen's *Klavierstück* (I haven't played those), but if I were to do that, having gone through the experience of learning the Boulez, it might had actually be harder to memorise, because I had to make that extra effort. Well, I can talk more about that, specific things about that piece. But that is the idea, so there were different motivations for both.

V: Now I would like to focus on the process of how did you learn and memorise those pieces. So, first, focusing on learning. I don't know if you want to choose 2 or 3 examples, or if you want to tell me in general, but I would like to know what aspects do you focus on when you are learning a piece and, in this case, a contemporary piece.

CG: Obviously, you have to take a piece, to respond to whatever challenges the piece presents to you. For example, a piece could be more rhythmically complex, more contrapunctually complex, more sort of gestuarly complex, more cognitively complex. So, you have to respond to those things, as a pianist. While in New York and while I collaborating with people there, I came to notice that the biggest thing for contemporary music was rhythm. My experience was always, just as a means of keeping the band together. So, everyone figures how they fit into a sort of pulse. As time goes on, hopefully, you can start to fit your parts, to the point that you can sort of master and then think about how it sounds and the overall soundscape, but the pulse is the important thing. As pianists, this is a harder thing to do, because we don't tend to have as much experience in ensembles. Traditionally, we perform more in the solo round, so I always thought that my value as an ensemble pianist was more my ability to sort of follow an ensemble and be collaborative, as opposed to being a virtuoso. Just to be able to follow people and react to people, and to stay in time. Piano is also a contrapunctual instrument, many things happening simultaneously, so we have to take maybe a little bit more time into the practicalities. Because it is a given, you are sitting there in front of the keys, but you do have to figure out how you can have ten notes being played, or even more at a time and you have to think about just the physical, coordinative aspects of the music. I think that also gives us a greater ability to memorise things, because the patterns are that much more unique at any given moments, and as far as how they are performed and expressed in the actual finger work, if that make sense.

V: For example, when you started learning Boulez's Sonata No. 2, what were your steps? What did you do first and what are the things you do when you first approach a score?

CG: I actually pulled up the score just to remind myself, because I haven't looked at it in a while.Well, I can tell you that it was a piece that I didn't have a great deal of familiarity before learning it, and I wasn't necessarily sold on the piece, on it's aesthetic world, and on it's sort of gestural, on it's language of extremes. I was not necessarily sold on it. So, it was quite a long process until I actually felt that it was worth my time and to invest enormous amount of time. Learn this piece was a very unique experience. And a lot of that came from where I was coming from, which was not a lot of experience in this kind of music, but I suppose that this can be relevant to you, because this is like a sort of a prime for contemporary music in a sense. Something that is a little bit unique to this piece is that there are no time signatures, so each meter is a different meter obviously. And this is very frustrating at first, because you don't have this signposting guide, to guide your thinking, but actually you realise very early on that by design the composer doesn't wish to impose that, and that is sort of on the performer to figure out how to do it. So, actually, after going through the large amount of time of preparation that this piece involves, I actually found it quite exciting and liberating, because metric was not always a given. There were some measures that were clearly a 3/4, as opposed to 6/8, but other times, let's say, it's a 5/8, but it could be a 2 + 3 or a 3 + 2 and there are themes that sort of contradict each other. So, there was almost an improvised element, a freeing element, that forced me to impose my own interpretation on the piece in a very real way, that I think already served very much how I began to think of the piece as sort of my own, and to sort of nap my own instincts into it. I think that helped me memorise it better, because it forced me to think about those things very early on. In terms of process, I literally took each system at a time, and I thought about how I was going to subdivide and how I would use my own notation just to show that. When the moment of actually learning the notes came, well, you probably know this piece a little bit, so it is very striving, it is very sort of disjointed melodically. There are a lot of huge leaps all over the piano and this is all coincidental. This is all sort of against the pianisms of prior music with proximal finger work, scales, simple arpeggios. So, it not only doesn't do that, I think that violently confronts those things. So, all of the sudden you have all sorts of patterns. If he is taking what a sonata should be in terms of patterns, he is taking everything he can to confront those things and your hands and the way you learn the piece will be upsetting and you will have to relearn and there is never a moment that you can think, well this is the next logical pitch or chord in a sequence. It's always something new. And of course that is what make people to be very polarized about the piece. Actually, every few months, I check on that youtube video [video recording of his live performance of Boulez' Sonata No. 2]. There are Boulez's videos and comments on it all over the internet. I found it in another videos too, and they just say, this is so cacophonic. That is fine, I respect that, I had that position at one time in my life too, so I can't blame them too much. But, because there are no patterns (the patterns are all a higher level, not in a direct repetition sort of way, they happen in this higher sort of geometry), I had to learn every gesture very painstaincally. That probably goes without saying, but I remember learning the first page of this piece and

that would take me about half an afternoon to learn a system [laugh]. It is almost embarassing to say that now, because I think I would be a little bit better now. But at the time, it took an enormous amount of time just to figure out how the things lined up, and just to sort of get into my fingers, how these gestures worked, and how the fingering worked. He writes all these things that are sort of impractical and there are always weird polyphonic streams that don't seem to match when your hands are playing. Going back specifically to rhythm. Nothing is a given yo you. There is actually this chaotic music without thought. So, it was an early realization for me to cross this and just realise, no, this is obviously very calculated, but it is not done with the performer in mind. And that is not a criticism that would be applicable to certain types of music, like Xenakis. But this is sort of an intellectual exercise. But very early on, there was just enough positive feedback, and I thought that it was very exhilarating and very worthy of my time. But that was after. I can't even over emphasize how painstaking it was to learn this thing, just from one measure to the next.

V: Do you remember how long it take for you to learn the piece? At least to know it from the beginning to the end?

CG: Sure, I started to learn the piece in 2009. I remember, I started the first movement in the summer of 2009. I had to do it in the summer, because it was the only time I had the time to invest on it, and then the following summer I spent a year, more or less, I had other things going on, but I spent a while just to get it into my fingers. And then it was the second movement, so I only planned to learn the first movement, and then I started to learn the second movement, during the second summer, and then that was when I actually really started to enjoy the piece, because the second movement I find so beautiful, so wonderful and that was when I start to feel like, well, this is so great, I have to perform this. If I am going to learn the second movement, which is I think 10 min long, I might just learn the whole thing, so that was when I started investing into the whole thing. But I didn't learn the other last two until 2011, and I had to perform in 2012. So, it took at least three years to learn the piece and different stages. It wasn't a continuous work, and again, obviously I didn't go through the piece due to the familiarity of the language. My rate of learning per system, let's say, per measure, was much faster by the time I got to the first movement, because I sort of internalised the compositional world a little bit more, and there were still more patterns, but there were certain gestures that he would go back to and some disjunctions that I sort of counter-expected and your hands actually get used to it. I will just say that one of the memorable things of learning this piece was just the physical brute force that it required to play. It's a very violent piece. So even though people look at it as being again sort of proto-serial piece, it is also a very violent piece, it's very deeply expressive and intense, so the physical commitment was something that was impressive for me. Something like Rachmaninoff I could play it mostly with the hands, but this was the first piece where I thought it was in my arms, I

could literately stay four hours in the afternoon learning let's say a page of this and actually giving with my hands, actually playing it over and over and actually feeling it over and over, with my biceps more than my shoulders. I never felt that before, it was like transforming my body to play this piece. That was really something.

V: That is very interesting. And you said that you played the first movement and than you stopped and then second movement. When you restarted learning the first movement, could you remember it?

CG: Yes, I think so. Actually, investing the time I did with the first movement, I don't think I have ever lost it. I haven't performed the piece since then, but to this day I can go over the piano and I can probably play it. It wouldn't be perfect, but all patterns would be there. I don't think I would actually never unlearn that first movement, because of how much I put into it.

V: Do you remember in what stage of learning did you start memorising?

CG: So this is important, I guess. I never set out to memorise this piece. I did not, whereas with the Schoenberg I think that was something I had in mind. If I have been told, early on, that 'you have to memorise this piece', I might have been so shocked by that, that I would have just given up entirely. But, I never set out to memorise it and this is a crazy thing. It was about a week or two before the performance that I decided to play it from memory. It was after three years of learning the piece, I never even thought of doing it from memory, and actually I have never put the piece together just one after the next, until the few weeks before. And it just occurred to me, that it's almost nothing to play this from memory, because I already know it. It's already in my hands, so much. But, more to the point, and this is maybe more to the point for what you are getting after. It was in my body, it wasn't just in my hands. So, all the sort of coordination of my arms and my shoulders and everything, it wasn't just my one, two, three fingers, but it was the entire thing have been mapped into my body. And I did nothing to play I from memory, because I had invested so much time into that, into the patterns. People were sort of schoked that I played it from memory, and what I told them was that it was the easiest thing to play that piece from memory, because transfer from playing it with the score to playing it from memory was the smallest effort I have ever taken, because I already had it in my fingers. So, I told them, if you invest the time necessary to learn this piece, you wouldn't have to worry about memorisation, since it's already there.

V: So, when you were performing that piece in public, do you remember what were you thinking on stage? I know that it was probably a long ago, but my question is, when you are performing from memory, what do you think?

CG: Well, funny thing about contemporary music and you probably had this experience as well. A lot of people who focus on contemporary music, arrives at that focus partially out of curiosity, but it is partially at some sort of reaction against a performance practitioner. That sort of lifestyle, that sort of tendency. So, for me, to perform and to memorise a piece of famous classical music, it causes great anxiety, because it is a piece that has been played hundreds of times, and what are you really contributing to the piece? If you would make a mistake it would have been very obvious. So, there is, obviously, a greater freedom when playing a contemporary piece of music, because you are not forced to confront those expectations in the same way. So you feel liberated in the sense that a missed step here or there will not be received as an idious crime, but at the same time it is self-imposed, almost in this sense to be authentic and to be true to the music. So, with a piece like this and with the majority of contemporary music, you are going into it and you think 'no one is going to know what I am doing up here' and so, it's my own responsibility. Of course, with the composer in the audience that is a different story all together, because they know how the piece goes. For a piece like that I knew that I was going to be on stage for thirty minutes playing music that no one could follow. In fact, I had masterclasses on this piece with people who were specialist in contemporary music, but even they couldn't follow the piece. But, yes, to go into that, and this is just generally speaking about a more general approach to why I do contemporary music, I don't feel way down upon by the sort of weight of performance history, I feel free to try to make a contribution to the community and to arouse people's curiosity. So, in this piece I don't remember being particularly nervous for it, because I had invested the time. Also, I don't know if you are like this, but for me playing a large scale piece is much easier than playing a short-scale piece. In fact, the Unsuk Chin *Etudes*, I don't remember that going particularly well, because it was part of this whole concert, a lot of different types of music and I was expected to go on, to play those two pieces and just five minutes of music, but insanely difficult. So that was sort of an expository moment. I find those moments to be very unforgiving, because you have to be in the moment and then, get out of it and play a large thirty minute piece. For those pieces I have to be able to pace my energy and my tension in a way that will still retain something for the last [moment], because there is so much going on before that. And the last, itself, somehow, transcends the other movements in terms of its expressive brain.

V: Just one last question about the Boulez. In your last practice sessions before the performance, for example, the last week, what were you focusing on?

CG: At that time it was about consolidating all the movements and conveying a sort of structural art to the piece, as opposed to subdivide moment by moment. So, whenever you learn a piece of music, you have a sort of magnifying glass you put on a part of the piece and then gradually you learn it and you expand the range of what you are looking at. Basically, this piece forced me to magnify to a degree, like to put

on the magnifying lenght to an extent that I have never experienced before. It was literally just one note at time, for many minutes. So, basically, the years that it took to learn this piece, just that process of gradually expanding, from playing a little gesture of a couple of notes, a little motif and then a measure and then a system, and it was that same work in process all the way through from the beginning of the piece. So leading out to the performance it was about taking big chunks, entire pages, entire movements and just thinking about the overall form. Of course those are the things that, when you learn a Schubert's sonata, you are thinking about those things straight from the beginning, because you already know the piece, you heard it, you've got it in your hands a little bit, you are always thinking about large scale, architectural things, so that is something that only came at the very end of this piece, sort of by necessity, but if I were to play again some more, I think I would be thinking more about t overall expressivity, about the way that piece breaths in a true sonata way.

V: And did you just perform it one time or did you do several concerts?

CG: I performed the first movement in a few different contexts, because it was the only time that I played, actually first and second movement, I played sort of smaller scale things. But this was the only time that I played the whole thing from start to finish. And it was a crazy experience. When I got to the last page of the second movement, all the sudden is like the easiest page in the whole piece, I thought 'I can't believe that I actually got to do the whole thing'.

V: Yes, I can image. And physically, I can imagine how exhausting.

CG: Yes.

V: Now, this is very interesting. So, can I just ask one more example, a different one, for example Schoenberg?

CG: Sure. I can try to recall that. So, these were five pieces [Schoenberg Five Piano pieces Op. 23] and I had learned the third piece for an audition, for a Festival in Lucern. This was one of the required pieces. So, the third movement is sort of the hardest, maybe the most, the most severe just in terms of its patterns, almost like Boulez's Sonata. I learned that one before and I had it in my fingers. I think I can play it from memory, just for the same reasons as for the Boulez, just out of necessity, and I liked it a lot. So, I learned the other movements and some of them were a little easier, some of them required some extra effort to be able to reproduce from memory. Let me try to think. For instance, the last movement, the *Waltz*. The important thing in that piece, is that it sort of transcends traditional aesthetics. So for that, in particular, I was thinking about how the piece was danced and just being able to move with the music and use these moments and moments of pause, and just have fun with it. To bearing the sort of energy that I think a lot of people would expect from a 20th century

piece of music. I guess my strategy in those pieces was, again, to import the expressive devices and expressive strategies from older musics and actually into almost over reach with them, to exhagerate, just for the sake of creating this sort of sense of sentimentality. I think that this served me in the memorisation process as well, just sort of thinking about these things in terms of overall expressions and to convey that. I don't really have specific details about this. I could look into it a little bit, but each piece was, it sort of had a nice balance between music that can require a really special approach to every system and to every page, because it was not patterned in the same way as Brahms, but also music having really interpretative strategies. You can come out to an actually very unique performative approach, that I think leads itself to memorisation in two ways, intellectually but also corporally. Whereas in the Boulez it was more just like execution, I guess.

V: Yes, so can you give me an example. When you first see a score, and you start learning it. Do you know what is the first thing you go through?

CG: Yes, it depends if it's a solo piece or an ensemble piece, because I think that, if it's an ensemble piece, the first thing is to see what other people are doing and how I fit in. I think my experience in New York taught me to think rhythm first, because you need to think about how things align rhythmically, how the rhythm interacts with the meter. That is the first thing to follow usually. And then after that I will seek out the gestures, the piano parts that are sort of the most difficult and, you know, what makes them difficult could depend on a lot of different things. In contemporary music it can be related to how much it confronts the traditional pattern, but also to the speed that it happens. Actually, I give this advice to composers who are writing for the piano, because sometimes people say 'this is impossible', and I almost always say 'it's possible' and I also say, 'you know, if you can play it at 10% in tempo, then someone good can play it at 100% in tempo', so I always take a piece and I will work on it slowly and, with time, I then speed it up. So, I don't tend to use a metronome as much, as I probably should, but I find that I can learn, I can figure intuitively very quickly what tempo I need to go at a certain stage, or to play in time accurately and then just to increase that tempo. I mean, is the same for every kind of music, but when you have played enough contemporary music usually you can come to expect things a little bit better. I am lucky, I am a pretty good sight-reader and that has helped me a lot. I think that a lot of contemporary musicians tend to be good sight-readers, just out of necessity, you know how it is. Your initial question was just about how I approach learning the piece?

V: Yes, so for example, you receive a score and what is the first thing you do?

CG: Well I try to play it through a couple of times, obviously. I will see if there are any things that are hard or impossible to play. But I also tend not to mark up my scores very much and this might be a useful strategy. I don't know what your strategy

is, but in the Boulez I wrote the metric, because that was important to retain, but actually I write very little. I write very little annotations, like fingering, or articulation and circuling dynamic markings, because, I don't know, I feel that once I have internalised something for the first time, once I realised, this is *forte*, I should really play this *fortissimo*, I don't feel that writing *fortissimo* there is really going to help me, because I have already sort of internalised it and, I mean, maybe it's an arrogance on my part, I don't know, but I like to keep the score as it is, because I think that this narrows the range of interpretation that you can have with this sort of music. Going back to the Schoenberg piece. There is this feeling that contemporary music must be played in a certain way and that there isn't room for expressivity, but of course there is and those extra markings are just in response to a more complex musical language, let's say, just an effort to be more communicative in the score, but that doesn't mean to restrict the range of interpretation. So, I try not to burn my scores with a lot of annotations. That is just my own personal feeling and it's true in older music too, when I play classical, romantic. I like to feel that if I go into one thing and I make an adjustement the first time, I am not going to have to remind myself for future times and that tends to help me, I think.

V: This leads also to another question. Do you use the same practice and memorisation strategies for different styles of repertoire?

CG: I think there is a profound difference between hearing a piece of music before or between learning it for the first time, whether is classical or contemporary. If you don't know the piece, if it's a premiere or you just don't know it as well, I think you have to put in a lot more effort to navigate the structure, the formal articulation. I remember playing, I don't know if you have played Steve Reich at all, so I played *Piano phase*. I don't know if you have played that piece. Obviously that is a totally different learning experience for that piece and most of that work would have to be done with the other pianists just in terms of being a truly collaborative, to think rhythmically, to think in terms of pulse in a way. I played a big orchestral piece of his called *Desert music*, where, I mean, I faced challenges never confronted before. I would say, I wasn't having to memorise that piece, but I was having to go between a piano and a sinthesizer for about five times over the course of that piece, which was over 40 min long. As you are going between the different stations you have to listen to how many repetitions happen and then you have to remember what is happening there. But the loop pulsation thing, well, in Boulez's case, where it actually embraces patterns, becomes this apotheosis of the style itself. That is a totally different working method, because it's almost like you have to invest yourself totally into the music, you almost have to take a step out and to think of how the sort of machine is running and how to you fit into it. And that is a totally different experience. And this is why learning it was very fruitful for me. I had some hesitations about it aesthetically, but once you have actually played it, music appreciation will overcome challenges, let's say. It can be a very exciting experience, and you have to be prepared to think about

the music in a totally different way. I am playing a music right now. It's about a piano piece by an American composer called Eric Wubbels. I think he is one of the better young generation composers in New York. He does this thing where he works with looping things. But it is very virtuosic and like post-spectral, so he will have this crazy gesture and repeat like for fourty times, and you do the next thing, and you repeat it six times. and it's prepared piano, and all kinds of weird things and that is also like a totally different experience to learn that piece, because it's very much in blocks. Actually they have memorised that piece. That's the funny thing, it's a 30 minute piece for violin and piano and it was a piece that, again, you look at the score and there is all kinds of complexities to it, and asymmetric looping numbers (this repeats 7 times, the next one repeats 31 times). All these crazy things. When you have to think about it in such urgent terms all the time when you are performing it, you almost have to get to that point where you can play without the book, because to look at the music it's a distraction. And now is the point that I have reached with the Boulez, and I think that tends to be the point. The tendency of pianists, to play from memory, is not just an attempt to be virtuous and to be, you know, sort of extravagant. It's about the score being less a burden at a certain point, because the information is already in my head, I am not looking at the score, I am looking to my hands, basically. I am just trying to navigate the piano as I jump around like crazy. So this piece piece that I am learning is different, of course, because it is for violin and piano and there is an extra motivation to have it memorised, because then it frees you to look at the performer, if you know it that well. But, it's a funny thing, because I said earlier when you play an ensemble piece you want to be able to look at their part and to understand. Maybe in a duet scenario you can know one of his part so intimately that you may be gaining something just to be free to look at the person. And in this piece we have the main aesthetic underline theme, we both have weird things, we are both playing the same gesture, but I am playing something that is a bad translation of the piano to the violin gesture and then she is playing like a bad translation of a piano gesture.

V: Are you using any specific strategies to memorise the piece?

CG: That piece in particular? Well, I don't think I am going to have that one memorised. We will see. That is another case where I am not setting out to memorise. I think that the composer is the only one who has performed it before, but he is taking it on a tour and I think in his case was the same thing. I don't think that they have setted out to memorise. I just think that they came out to this realisation. The physical patterning is such that you have to be able to play it from memory. So, for that piece, if I were to set out memorisation, I think the hardest thing would be just to remember and internalise all these different loop things and so literally he will give like a measure, a bracket over and say just play this 21 times, so just to remember this, specially when, sometimes, the cells are like the size of a thirty second note and he will say play this, you know 58 times. So, of course you start to group that, you know,

use your mind to group that into three and to think about it in terms of large-scale and literally counting from 1 to 51, but I imagine that would be the hardest thing. But also you would be free in doing it from memory and you would be able to check in on the performer. This is a really fun and unique totally different musical language, where there are minimalism challenges, but there are also big spectral, big piano music problems. Gesturally is very hard, so you have to reconcile. It's a fun challenge.

V: Are there any other examples of this kind that you would like to talk about? Do you think this sums up more or less your approach?

CG: Yes, I think so, I can think about some more, about some thing that I have forgot. Last year I played Schumann's *Humoreske.* So I played that from memory and that was the first time that I have played a big classical piece from memory and it was the first time doing something of that scale from memory since the Boulez. Actually, I think that I was served by that a little bit as well.

V: What do you mean being served by that?

CG: Yes, just in terms of being able to memorise a large-scale piece of music. Some of, let's say, over twenty minutes. I think that when you play a piece that is so long, on the one hand it would seem harder to memorise just because the scale of it, but I think that the longer the piece of music, the more I tend to give attention to all these different time scales and how they interact with each other. Thinking more as a composer here, I am very compelled to quite larger scale music, like Mahler, one of my favourite composers. How you actually create the sort of hierarchies, the connections across fourty minutes of music. And it's a crazy thing, but you have to perform it. And I do think that playing from memory consolidates some of those large scale complexities, just to make them more clear, as opposed to a three minute piano piece. Things are much more compact, so it's a bit of a paradox, but I would almost say, the longest scale piece of music, the easier it is and the more fruitful it is to play it from memory, because there are a lot of, there are more cognitive things at play. And those force you to think about the music in a different way and maybe encourages memorisation, but also I think that would serve better my memorisation.

V: Do you remember how did you approach memorisation of Schumann's Humoreske? Do you remember, in what stage of learning did you start doing it? And what strategies did you use?

CG: You want to know from a pedagogical perspective, and I am afraid that I generally not set out to memorise. Maybe that is my secret, so I never set out to memorise. I teach piano too as well, and I had people trying to memorise things for performances and I think what they do is, when they know that memorisation is happening, they learn the piece in a different way, and maybe this might have been

how I was taught early on, I don't remember, but it would be like, 'ok, for next week, next lesson, be sure to have p. 3 memorised, be sure to play it for me from memory', and I have the suspicion that that is not the right way to do it. I have a suspicion that the best way to do it is to learn the music and to really have it physically in your body and then to think of how the piece works together as a totality. I think that only then memorisation can be really valuable and only then can it be of any service. Otherwise is just notes. Maybe there could be a bias here, because I had the experience of doing it and maybe it's easier for me to memorise it, because I sort of calculated this sort of patterns into my fingers and I don't have to think about them as much, but I have this suspicion that memorisation is something that should happen at the very end, when you have incorporated all the formal elements in the piece. I think that you have to take different strategies for different pieces, when you memorise it, but I suspect that it should be something that comes at the end. I suspect that since you are working on a sort of lab in contemporary music, it is not such a big deal, but in most conservatoire models it's absolutely enforced and it's interesting to see people come against that, and questioning the merits of doing this and why did this become the standard, why is this still the standard. I don't think it's virtuous one way or the other. It depends on what your project is.

V: Yes, definitely. Ok, so we are almost finishing. I just want to touch upon another topic. What skills do you think a performer should have to be able to learn and perform contemporary music?

CG: Honestly, I think that the most important skill is curiosity. And maybe that is not a skill, but that is the most important thing. If you are not curious about learning these things, you will always approach a piece of music and you will be confronted by a piece of music and it will rate against your expectations and it will make it a miserable experience for you. So, if you don't have an open mind, if you don't want to learn things from the composer perspective, I don't think you will develop all the other necessary tools. I have to say that pianists can be some of the least curious people. I think that the competition landscape reinforces that. I also think that it's important to play all kinds of different music. I think it is important not to specialize in contemporary music only. I think that the best contemporary perfomers I know were trained in conservatoires and they still play old music. I think that is really important, and as an audience member I am most excited by programmes that mix. So, these are more abstract things, obviously, being open minded and curious. But in terms of skills with contemporary music, again, rhythm is very important too. That is usually the least adopted faculty of a pianist, traditional pianist. So that is something that you do if you have to do chamber music. Again that is the best way to learn rhythm because you learn from other people, not really from yourself. But I think the other skill is, you know, when you learn Chopin or Liszt, these are big pianistic composers. They don't just write music, they write piano music, and it falls into your hand in a very confortable way, even though it can take time to learn. Contemporary

music is usually less forgiving and is usually thinking about the piece in terms of music that is absolutely ideal, and, in some cases, that works too, but you have to be prepared to learn music that it is out of the way. Look, patterns are part of pedagogy, right? We learn scales, we learn arpeggios, because you want to be able to just apply them to anything from Bach up to Scriabin, or Ravel. Actually practising these scales and arpeggios served me well in a weird, perverse way, because I always hated this…maybe this is why I excel more in contemporary music. In this music is more about managing those confrontations that you have to face and to a have a collaborative spirit.

V: Do you think our educational background prepares us to have those skills?

CG: No [laugh]. I don't think so. I discovered contemporary music as a composer, so I didn't play contemporary music at all. And, as composer, I wasn't writing contemporary music, I was writing exercise pieces. So, it wasn't until I had friends who were like 'hey, I wrote a piano piece, can you play it?' that I really started. So, if I had not have that experience as a composer, I don't know if I would ever have that curiosity. And I was in a really good environment for my undergraduate. So, I was placed in the right position, to be inspired by and I think that most pianists are not put in that position. Here is something that I fight a lot with my pianist colleagues. They feel that to learn contemporary music in some way corrupts their appreciation of classical music. I think that speaks fundamentally to making music, because it speaks to the idea that you are playing music. You have to think, 'What are your motivations, if you can't handle ideas confronting where your musical ideas are?'People with those ideas are sort of lost anyway. They won't really make a contribution in my mind. What I always say is that I have never lost any appreciation for classical music, from my experience of playing contemporary music. It has only been informed. It has only made more complex and more enriched from my experience of playing contemporary music. When I learn music that requires rhythmic patterns that are far beyond anything that would be comprised by classical pieces, I go back and I play Mozart and it's the easiest thing in the world [laugh]. I have only been enriched by these experiences and I still play classical music all the time.

V: You were speaking about your experience as a composer. So, do you think that experience influences the way you approach the contemporary pieces that you perform?

CG: Yes. Again, I don't think that it's a coincidence that there is also a long history of pianist-composers. It goes back to the fact that you are the continuum player of what you are doing. You are playing the bass line or just underpinning everything that happens in the surface and then you are filling the harmony, so what are you doing? You are seeing the music, you are seeing the skeleton. You just sort of see the interior of a piece in a way that you wouldn't otherwise, so I think that certainly limitations

exist, there are instructions to that as well that I have to always think about when I am writing my music. How much am I writing about as a pianist as opposed to composer? Because obviously we have a very strong reference for pitch, righ? And that comes to the extent of a sort of sensitivity to tempo and colours and more subtle things in other instruments. Being a composer is sort of symbiotic. My writing influences my playing, but it was the other way around too, maybe even to a greater extent.

V: Yes, and one last question. Have you collaborated with other composers as a pianist?

CG: Yes, certainly. I have done it my whole life. A lot of the time they are just sort of colleagues, but they can be more established people. Usually not. I am just thinking here mostly in a chamber setting. Again, I haven't done a lot of solo work. I don't find it as compelling as doing ensembles. There are pianists who like the spotlight and want to do solo works. But, when I have worked with composers for solo music I try to just treat them the way I want to be treated as a composer, right? Again, I guess, I can build on that experience too, because, you know, sometimes there are ethical issues that people have when you are only sort of in your lane, you do what you do, they do what they do and there can be confrontations. But when I am doing I just try to think always how do I want to be treated as a composer and I deal with it. And pianists are, like I said earlier, special because we really don't come across things that can't be played, you know? It's like being a conductor, anything is possible, but, it's less forgiving I guess. You don't really get to say I can't do this, you just have to say, ok, this is hard [laugh], but I am going to try to do this. I knew one guy one time, a Columbian student who wrote a piece where I would have to go inside the piano and pluck a ten note chord, so like, a ten note chord on the piano, which is fine, but here I had to pluck each note and inside the piano. I remember that time saying, 'I absolutely cannot do that [laugh] and you should be punished for asking me to do that [laugh].

V: Ok, so for me this was amazing. I think it's everything. I don't know if you remember something else, if you want to add something to this.

Cg: No, I don't think so. I mean, I wish I could say more specifically about memorisation just like in terms of details, but I think the main thing that I wanted emphasize about memorisation of the Boulez piece is the whole body coordination as opposed to finger coordination. It was about this whole, there was a all dramaturgy to it, that I thought that made it harder to learn, but made it harder to unlearn.

V: Yes, of course.

CG: Do you know what I mean? Just because it involved so much more, took so much more out of my body to actually make it happen, and just like using each end of the keyboard, all these crazy extremes. You just don't find it in another repertoire. People

have asked me later, 'how did you memorise it?', and I just think 'what was unique in that piece that actually made it possible to do?' Because I remember that at the time it was just natural, it was easy. And try to think about those things. I think that those are the unique things about that piece that made it possible. But if I think about other things I will let you know.

V: Yes, of course. Thank you so much for this amazing interview

CG:Ok, my pleasure, and we will keep in touch.

8.5 INTERVIEW TRANSCRIPT ERMIS THEODORAKIS

V: First of all I would like to thank you for your collaboration in this project and for being so kind in receiving me in your house. I am a doctoral student at the Royal College of Music and I am working on the topic of musical memorisation, focusing on specific styles of repertoire, in particular contemporary music. Can we begin?

ET: Yes.

V: Ok, so I know that you have played and recorded a wide range of contemporary repertoire, that you have premiered several works by contemporary composers, but that you have also performed some more traditional repertoire, namely composers such as Brahms, Chopin. Is this correct?

ET: Yes, that is true, although I have to say that more than 90% of what I am doing is really contemporary and I am really in the complex direction, working with music with several layers and notes.

V: Can you describe in more detail the repertoire you have been playing?

ET: Yes, I started my career with two focus points of my repertoire. One was the Second Viennese School, Schoenberg, Berg, Webern. I was 15 years old when I gave my first recital with works by those three composers. One or two years later, I played the complete piano works by Iannis Xenakis. After Xenakis, – I used to live in Greece, in Athens at that time – I worked with several Greek contemporary composers, less internationally known, but I got to discover some nice music. It was always atonal music and I was always asked to do difficult pieces, because I had already built a reputation around Xenakis and his music is difficult. Xenakis' music. Later on, from 2002, I added some New Complexity composers in my repertoire, like Claus-Steffen Mahnkopf, Brian Ferneyhough, Mark Andre, Frank Cox. This is another focus point of my repertoire.

V: Why did you become interested in contemporary music?

ET: Well, it is not because of my family, there was hardly any classical music at home and there was no musical background in my family. It was mostly because of my first music teacher in Athens, Greece, Yannis Ioannidis. He is a conductor and contemporary composer and he taught all theory subjects in one big lesson, about three hours every week. He talked to the class very often about contemporary music and explained the early atonality and also the post-war atonal music. I did this class already when I was eleven and got immediately interested in such music. I started to play the Six Little Pieces Op. 19 by Schoenberg, just experimenting. Well, I had piano lessons playing the normal repertoire, Chopin *Etudes* or some early Beethoven *Sonatas* or pieces like this. This teacher discovered that I was really serious about wanting to play atonal music, he encouraged me and then I started playing Alban Berg's *Piano Sonata* and Webern's *Variations*. Then, in 1994 I played my first public recital with these pieces.

V: Which I imagine was a success.

ET: Yes, and also it was a total enjoyment for me. It was really something that I wanted to do and that I felt that I had found a way.

V: Do you play your repertoire from memory?

ET: Yes. I play really every solo piece from memory. I play with scores only if I have to do chamber music, only if I accompany somebody. But, mostly even if I play with the score, I know it from memory as well.

V: And why do you decide to memorise?

ET: Well, it is not a decision, it was for me kind of an automatic process of learning. I was like 14 or15 years old, I had to go to public school and I had to be there for more than eight hours and to do a lot of homework at home. So, there was no time to practice the piano for four or five hours a day. And school was boring, school was really bad. I was not that lucky to have some nice, or interesting, or exciting school environment, no particular friends, I was kind of isolated and I wanted to be effective with my time, so the best way to work on music was to take it with me, in my mind. So, I tried to imagine how it is playing the piano without a piano and without score, and this implies memorising.

V: For you, what are the advantages and disadvantages of playing from memory?

ET: I don't think there are any disadvantages, for me at least. It is part of the process. The advantage is some kind of freedom. If you play something from memory, you have absorbed the work in a way and you are really free from technical details, how to turn the pages, or from having a page turner or not. Mostly, you are more acquainted with the work.

V: Now I would like to focus on the process. First the process of learning and then we can focus on memorising. So, what aspects to you attend to during practice? What do you focus on when you are practising a contemporary piece? And I would like to ask you if you could give me specific examples of pieces you have played.

ET: Yes and this is why we are doing the interview here, because I have my scores and it would not be very practical to do this in a cafe. Regarding the process, now it might have changed, but for me the learning process was always like this, because until I was 18 I was studying in school and I had to keep my mind busy with interesting things and so I was memorising the pieces I wanted to play. Then, I had more time, but I was at the university, then I moved to Amsterdam and for six years I didn't have an instrument of my own, so I had to wait in the queue at the conservatory to practice. There were more students than practice rooms, always, so I had the possibility of doing perhaps two or three hours a day and not more. But I had more time than that to learn music. So what I did was really to stay at my apartment, put perhaps some other music on, like pop music on the TV, or watch a movie, and, at the same time, really learn the piece, just by reading the music and imagining how it sounds – and not only how it sounds but also how it feels like playing it. This means imagining effectively what kinds of fingerings I would use, what kind of pedal I would use, articulation, and solving such problems on the table. Then I would go to the piano, try my solutions, if they work. I am still doing this nowadays.

V: As an example, in a piece by Xenakis, if you are asked to learn it, what is the first thing you do? Can you explain me? I don't know if you want to choose one and just take me through the process?

ET: Yes, do you know the pieces, have you seen the scores?

V: It depends, can you show me?

ET: You know that there are four major works.

V: Yes.

ET: *Mists.* Do you know it?

V: Mists. Yes I never played it but I know it and I have seen your recording.

ET: Yes [looked for other scores]. This is *Evryali*. I don't know which one is the most difficult. They are very different pieces.

V: So, for example, if you receive this score, how would you start learning it?

ET: First I have to see what the piece is about and with this I mean not in a poetical sense, such as describing the nature or feelings. I try much more to see how the form works, what parts it has and also the composition methods; for instance if it is really twelve tone music or if there are any special chords or intervallic formations. A great deal of contemporary music is not twelve-tone anymore, but there are other kinds of pitch organisations. Xenakis has a lot of methods, which I happen to known as a composer. I am also a composer, so I am also actively involved in such questions or problems, how to organise pitches and of course it is a great help if I discover some kind of method. Sometimes I don't find any, because there is also music which is really concretely written, so no improvisation, but with pitches or chords deriving from random functions. For instance, do you know the beginning of Eonta by Xenakis?

V: Yes.

ET: [It contains] a lot of leaps and the pitches are, for the first forty measures, really random. So there is really no logic behind the successions of the pitches. Then, you have to invent a logic in this case.

V: How did you do that?

ET: I started learning atonal music with the works of Schoenberg, Berg and also Skalkottas (Greek composer, one of Schoenberg's pupils). The early atonal composers started to think beyond triads or chords of four pitches or to form triads with different intervals, even using principles from Set Theory. For everybody who plays tonal music this [played C Major chord] is a recognizable entity, so there is a major and a minor third or inverted [played C minor chord] or even this [played several examples of seventh chords] or even more complex things, with augmented or diminished intervals. Well, but if you know some of Webern's music [played examples of chords], so major third plus semitone, is also something recognisable, or this one [played other examples]. This is how I start. Even if I have to memorise the absolute chaos, then I try to group the pitches in these kinds of models.

V: Yes, very interesting.

ET: By using, for example, *Set Theory* you can really restrict everything into an augmented fourth and every combination of intervals can be inside it [played several

examples]. And of course you can have different distributions in the musical range of the piano and of course I am happy that there are no microtones, as in other instruments.

V: Yes, exactly. We just have keys.

ET: Whatever happens with the music in the future, whatever composers invent as pitch organisations, the possibilities for piano are going to be within these twelve tones, so my system will be sustainable also for the music of the future, as long as composers still write for piano and don't find it too boring.

V: Exactly. And regarding practice, how do you organize it? Do you play the whole piece or do you divide it?

ET: I really have to divide it, certainly. First of all I have to understand what the piece is about, as I said. Then I try from the beginning, or I choose some parts that I consider difficult. This is what everybody does, for example focus on things that might be difficult and solve them. And then if you have solved the most difficult parts, you can proceed further.

V: And what other aspects do you focus on? Is there anything else that you focus on while practising these pieces?

ET: Details can be really infinite. It really depends on the composer and the concept of the composition. If sound, density or texture are more important, then I try to refine these things. Of course I try to do this from the beginning. I don't practice by playing everything forte at first and then do the dynamics. I try to imagine the final result from the beginning and then do it. But, of course, during the process of learning a piece, this gets always refined. Perhaps from time to time, when one plays a piece on a stage, it can also be different or you can consciously revise some details or even more fundamental parts of the interpretation. It's also possible not only to revise consciously, but also to change some things subconsciously, because with your experience and building up new repertoire, you always get different perspectives.

V: Of course. Do you use the same practice approach in different styles of repertoire?For example pieces from the romantic period or contemporary music?

ET: Yes, I don't do anything different for learning the pieces. The pieces are different enough. Of course I try to develop another interpretation, another approach for every style of music, whether it's contemporary, romantic, or classical. The learning process is though quite the same. I have to learn the piece, to understand it, to imagine how it should sound, and then work on technical issues and on details that don't quite work has I have imagined.

V: Now focusing particularly on memorisation. For example on Herma or other piece, can you tell me your strategies of memorisation. How did you memorise them?

ET: I think I will summarize what I said before. It is helpful to discover some compositional technique for the pitches, or for the rhythms. Sometimes it is not helpful, but confusing, so I have to discover my own principles for learning the music. Then I just repeat in my head what I have to memorise. I also do it photographically, this is kind of an extra aid of memory. It is mostly with pieces that I have learned recently. I always know when the pitch changes, or when there is a line break, or where the systems change. This is a kind of memory which is not a musical one, but it helps. You don't get lost.

V: Of course. And again, do you use the same strategies for different styles of repertoire?

ET: Yes, certainly. Even if I have to play a *Nocturne* by Chopin, I am going to use the same approach. I will have a picture of the pages and of course use my structural, my acoustical and my motoric memory.

V: How do you develop, for example, the motoric memory?

ET: By playing and by imagining fingerings. If you know a language and you have to read a poem, you don't have to read it out loud. You can imagine how it sounds in your head. I can do it with most part of the written music. Perhaps not with the instruments that I am not really familiar with, or with very complex scores, with seventy or eighty different parts, for example the biggest scores by Xenakis or Ferneyhough, but I don't think that anybody can imagine these really exactly. But, with the piano I can really imagine how it sounds; through my experience on the piano, I don't only have a picture of the sound, but also a picture of the movements that I am making. I can really study on the table and do some big part of the work. Then I have only to verify it on the piano.

V: Can I take for example, the first part of Herma [by Xenakis]. Can I ask you for example if you were practising these two first systems and memorising them, how would you do this? How would you find the principles you were speaking about here?

ET: That is a good question, because we really have here random pitches.

V: This is what I am interested in. So, how can you find logic in these illogical scores?

ET: I think everybody can remember and notice that the piece starts with this E [played]. Then it is quite easy, because you have mostly one pitch at a time and this means you can really imagine these intervals melodically [played opening of *Herma*]. Then you can think of these intervals also within one octave, in order to get these harmonic entities that I was talking about [exemplified] and they are distributed in different registers [exemplified]. The different registers are not a problem to memorise, because they sound really different acoustically. If these pitches were differently distributed [performed different examples of how pitches could be distributed], the sound is really different, the fingering you are going to use is also different. The assistance of the pedal would be eventually different [continued performing examples of how pitches can be organized in the opening of *Herma*]. For this you don't need any pedal, but in order to play the pitches piano, legato, but kind of connected [performed the original opening of *Herma*]. For this you need it.

V: Very interesting. And for example a very complex rhythmical passage.

ET: Yes, so for example, rhythmical complexity. And then we can speak about, for instance, Claus-Steffen Mahnkopf or Frank Cox. Do you know this composer? Claus-Steffen Mahnkopf?

V: Yes, yes. I don't know this piece [*Rhizom* by Claus-Steffen Mahnkopf].

ET: It was composed in the same time as *Lemma-Icon-Epigram* by Ferneyhough. I think it is a bit more difficult.

V: Yes, it is an impressive score.

ET: Yes, of course, for things like this I have to do some preliminary work. Only practising the pitches does not help. You have to calculate the speeds, you have to see how it works within the beat.

V: So, how do you tackle these rhythms and how do you memorise this, all of this?

ET: First of all you have to understand what is happening in every measure. For instance, bar 1, right hand [referring to *Rhizom*, by Claus-Steffen Mahnkopf]. It is a 9/16 bar and then you have a quintuplet. This means five quavers instead of four. Now, if you have tempo with quaver beat at 48, you calculate how quick this is. You don't always have to think in straight quavers. You can modulate your tempo, because you are a soloist. If you have to play with a conductor, then the first thing you have to do is to draw some lines, to mark the beats for the piece. Then you calculate how quick this tempo is. And then it's quite straightforward [sings the rhythm]. The last one of course is not a semiquaver in this tempo, but in this one. So, you have to modulate back. I am speaking about metric, tempo modulations. If you have

somewhere a steady pulse, then you play two or three lines and you can use this steady pulse for orienting things. This is the same thing with the rhythmical complexity in Xenakis's *Mists*. It seems complex, but it is quite cleverly written. For example, you have always the main pulse [sings the pulse] – so quavers - and then you have to place the other values in between, but not approximately in between, you have to try to be pretty exact with this. Now, concerning memorisation, you might ask if it is important to learn all these rhythms, also by heart, in order to be able to write them back on paper if you were asked to. In this question the answer can be variable. In places just like this, where you have a cloud of superposed lines, I think I just remember where the pulses come and I try to listen to every part, to every voice in order to get it regular, to be exact with the rhythms, but I eventually cannot tell every moment if it is six to seven, I just know what I have to do and my orientation points. These are the beats – Xenakis notated them already and did thus some work for the pianist.

V: So, how do you go about memorising this? And also reading?

ET: Reading? This is supposed to be easier actually [*Mists* by Xenakis, pp. 4-5]. You have a pulse, which is mostly fictive if you don't have pitches on the beats, but it is enough to get orientated. And then you just learn the pitch succession, and here is also clear that it is not about melodic connexity. This kind of notation (pp. 1-3) suggests melodic connexity, which means that the composer thinks in terms of lines, even if they finally form clouds in this piece. So, these (pp. 4-5) are just conglomerates of pitches, just clouds, with no melody.

V: So, how do you find principles here? Can you explain? How would you organize this?

ET: It is quite easy to find an intervallic structure in the piece Mists, because Xenakis uses his Principle of Sieves, if you know about this. It is a method in which he constructs scales, which are not repeated in the octaves and go through the whole range of the instrument. This is the main scale [played the scale]. This is a succession of intervals. When a particular scale is in use, then it is like as if there are no other keys, everything that happens here on this scale would have this complete intervallic structure. It doesn't matter if there are clouds or melodies, you will have the same sound, you will have the same intervals. Of course he doesn't only use this scale, he uses other rotations and transportations, but the principle is the same and this is also a great help.

V:Yes, definitely, so you have to know his language.

ET: Yes, it is like this with every piece. With every composer you learn how to speak different languages.

V: Exactly, definitely. In pieces like this, you have many markings regarding pedal, dynamics, it is quite detailed. How do you memorise these details? Do you remember all of them? I mean, not only Xenakis, but in other pieces?

ET: Yes. This [*Rhizom* by Mahnkopf] is really extreme. There are really many kinds of articulations.

V: So, how do you go about memorising all of this?

ET: Some things you memorise motorically and a lot of things you have really concrete in your head. Also in tonal music, you have to know by heart if a passage is loud, or *mf*, or if it is *staccato,* or *leggiero,* or *legato*, or if you play with pedal or without. These are also things that are pretty easy to recognize and they also really feel differently when you play corporally, with your body. If you play soft, you have to hold back a bit, if you play loud you have to give more energy. And *staccato* playing feels also different than *legato*. You do it several times with score – or imagine how it feels – and then it stays there.

V: We have been talking about new complexity and this type of works. Can you give me some examples of the Second Viennese school, for example Schoenberg or Alban Berg's Sonata?

ET: Yes. Here, in these copies I have the complete second Viennese school [opened the score from Alban Berg's *Piano Sonata*]. Here the harmonic and pitch principles are really much more classical. This total chromaticism in this sonata is not really that far away from Wagner. Of course there are chords in this sonata that people who play exclusively tonal music will recognize, such as minor chords, augmented chords and G major, second inversion, E flat minor and also more complex chords, but within this formation of augmented fourth. But in principle there are still recognisable, almost tonal elements extended. When I used to teach, some pupils had difficulties with memorising this succession of chords in this piece and I always advised them to understand and think of these entities [performed minor third plus semitone]. If you are familiar with this music, you can really recognize a special character in every single chord, so that this is really different than this [played a tonal chord]. The melodies are of course not so difficult to memorise.

V: Do you think about dodecaphonic language?

ET: Sometimes yes, sometimes no. For example, in Schoenberg's Op. 23. Here the composer starts to work with some rows and the last piece is the first dodecaphonic piece in history. But these twelve-tone rows are kind of thematic and you can really see them repeated always as melodies or condensed as chords or distributed

[exemplifies on the piano how twelve-tone rows are distributed in Schoenberg's Op. 23 nº 5, *Walzer*]. And at the same time you have motives that repeat themselves and melodic formations. [Performed other excerpts from Op. 23 nº 5] These are the same pitches as in the beginning. So, this is quite simple and it goes like this all the time [performed several excerpts of the piece demonstrating motivic repetition]. Some deviations might appear, but those are exceptions, but it doesn't matter because these are the interesting parts of the composition.

V: Very interesting. And for example music inside the piano? Do you memorise pieces for prepared piano in the same way?

ET: Yes, although I have to say that a great deal of music which has actions inside the piano is chamber music and then you have to play with score and, in many cases, with a conductor. There are though solo works that need this, too. The most famous example is probably George Crumb's *Makrokosmos.*

V: Yes, exactly. So, have you played it?

ET: No, the problem is that for book two I cannot whistle [exemplified]. It is not good.

V: Yes, I also don't like the part where you have to scream [laugh]. I am shy [laugh].

ET: I have the same problem and this excludes several pieces from my repertoire, for instance *Opus Contra Naturam* by Ferneyhough. The pianist needs to be an actor, a speaking pianist and I cannot do it.

V: But have you ever played any solo piece for prepared piano? And how did you memorise?

ET: It is quite the same, even if I have to play chamber music with a conductor I will also memorise chamber music, because I don't have the time to look at the score really.

V: So, what do you focus on?

ET: Of course the first thing I have to focus on is to really learn the pitches and the rhythm exactly, so that I can adapt and focus if I have to play on another instrument. Well, you know the problems.

V: Yes, it is quite different.

ET: The different frames in the instrument, the *flageoletts* (overtones) and multiphonics can be really different from one instrument to another. So, you have to be quick with these things, because you have only one rehearsal and then you have the concert. If you really know the music well, then you are able to deal with these kinds of problems.

V: Have you also played Boulez, for example?

ET: Not yet.

V: Maybe the next challenge [laugh].

ET: Yes, it might be. I have played Berio's *Sequenza IV* and Stockhausen, some of the *Klavierstücke* and piano pieces by Messiaen. I studied with a Messiaen specialist in Amsterdam, Håkon Austbö.

V: And for example, with Messiaen. I keep asking the same question. Do you use the same approach?

ET: No, do you know the music of Messiaen?

V: Yes.

ET: There are several keys of memorising his music, for example his modes and his rhythms (*rythmes non rétrogradables*), the modes with limited transportations and his typical chords with resonance. One thing which is very tricky to memorise are the *angradissements asymétriques*. I have it here, I have played this about fifteen years ago. I would love to do it again. Do you know the work *Vingt Regards [sur l'Enfant-Jésus]?* This is probably the most difficult one, number 6. I enjoyed learning it, except for one part, that of angradissements asymétriques

V: So, why is that part so difficult?

ET: Well, because you have kind of harmonic progressions. This means you have repetitions of this one bar [indicated on the score] for more than one page, which are not exactly the same [exemplified]. This means it is the same motif, the same melody you follow [exemplified the differences on the piano], but some intervals move from time to time upwards, some downwards and they produce tiny differences. The start or the ending are not totally different, but the whole process is really difficult to memorise.

V: So, how did you do it? How did you memorise these slight differences?

ET: This took some time, lots of movies and videoclips watching in Amsterdam [laugh], at the same time, and trying to bring everything in my head without getting confused. Of course I invented some places, some features to hold on to. For instance, what is the initial chord that every bar starts with [exemplified the beginnings of every chord]. Every triad has a different character [continued exemplifying different chords]. Look, this is really confusing [continued demonstrating the differences between the chords]. And then the *angradissement* goes further, but now it has different periods, so the left hand has a different repetition period than the right hand, and then it is easier, paradoxically. But it is easier because every bar is now notably different.

V: Yes, the main problem is the slight difference because you get confused.

ET: Right. This is an interesting phenomenon. I had it also with Claus-Steffen Mahnkopf's music. Actually, in the piece that is supposed to be his easiest one, but it is not. Let me find it. This is a later piece by Claus-Steffen Mahnkopf [*Beethoven-Kommentar*], which is really easier than *Rhizom,* with more conventional notation and not so many layers. As he says, this is a comment on Beethoven's Diabelli Variation 33[exemplified similarities between both pieces]. And then it goes further, it takes the same structure, so you have at the ending this thing [played an excerpt from the end of the piece and compared with Beethoven's Diabelli Variation 33]. This is actually a twelve-tone piece, but the row is the chromatic scale and this is really confusing [exemplified on the piano the confusing parts]. I will play it in tempo here so that you can recognize it [played more excerpts from the music]. So, it has chromatic melodies, with semitones or major sevens or minor ninths. And then again the same problem as with Messiaen: same motives, but [with] slightly different repetitions; I really prefer learning something that puts random information going on and on to something that repeats itself slightly differently.

V: Did you use the same approach?

ET: Yes, and I focus in these cases really on photographic memory. This means that system breaks and page breaks are really important in this case.

V: Do you have any more examples that you would like to talk about? Different things?

ET: These pieces [*Piano Etudes* by Franklin Cox] were the challenge I worked on last year, by Franklin Cox. Also a new complexity composer, he is doing really exceptionally complex music, with overlapping of a lot of methods for organizing pitches, rhythms, form. There are some unconventional measure types and then it starts like Ligeti etudes [exemplified singing], but then you get slight deviations of tempo, it is always extreme.

V: How do you deal with these type of rhythms?

ET: If the tempo is slow, you can calculate them exactly and you divide practically every beat in hundred parts and then you calculate exactly where to play. A typical example of this – I will show you – is this piece by Mark Andre [*Un-fini III*]. Here I used almost all my methods for calculating complex rhythms. Ok, the beginning is not difficult. You have quavers at 77 bpm, then grace notes, no problem. Do you know what this means? How you would work? [Shows a bar with 6/55 as time signature]

V: I am not sure.

ET: Actually it's a new tempo, but actually the best way to get there is to think of a semibreve divided into 55.

V: How would you calculate this?

ET: You have quavers at 77 of the metronome. This means the semibreve lasts 9.625 of the metronome (bpm). You don't find this in the metronome, but you already know. And then you multiply this by 55. And you get 529 bpm , if you divide it in 4, it becomes like 132 bpm [sang the rhythm]. Of course with experience you have to develop an absolute feeling of time too, not only pitch. You need to be able to say what is 77 or 132 in the metronome.

V: So you can feel the different tempos.

ET:Yes, this is the quickest way. Of course you can test the values with the metronome and here you have six 55^{ths}, so you take this value, approximately at 529 bpm, so the whole bar is like an impulse on 88.

V: How did you develop this sense of tempo?

ET: Ok, this has really to do with memorisation, too. You have some standard pieces of repertoire. For instance, for me 88 is the tempo from the *Pictures at an exhibition* by Modest Mussorgsky, the *Ballet of the Unhatched Chicks* [exemplified in the piano]. So, if I remember this exactly, then I have my 88. If I have to think of an 84, then I think about another piece or modulate a bit slower. Or for tempo 90, there is a piece that I played with sixteen years old by a Greek composer not very well-known [Georges Tsouyopoulos, *Toccata II*], but for me is quite significant [played an excerpt of the piece]. This is 90.

V: Very interesting.

ET: And of course from this speed I conclude what 180 is. Of course many pieces have metronome indication 60. So, from 60 you can have 80 if you think of dotted quavers; you can have 90 if you think of triplets, consequently you have also 160 and 180 or 120, of course. Ok, so this is the way how I approach complex rhythms.

V: How do you deal with putting together these rhythms? This is something very confusing for me when I am dealing with this type of rhythms [looking at Franklin Cox's *Piano Etude No.2*].

ET: You have to think of a very concrete beat that you use as orientation and then you have two lines above the main voice and under the main voice, which are supposed to be against/between the beats, and to have some regularity. I mean, these quintuplets have still to be exact. Even if you have two overlapping layers, brackets or these quintuplets, they have to be regular. They should not be approximate or like clouds, in this type of Xenakis' notation. So, you have to put the impulses between the beats, but then you have to listen to the voices while playing two or three voices, listen to every voice specifically, in order to get each layer regular. Because in styles like new complexity we are still dealing with lines. Xenakis is more about sound, or sound surfaces, or masses and there are mostly no melodies, but in this case, you have really lines that have to be brought out. Now, the next etude is the climax [*Piano Etude No. 3* by Franklin Cox], with four voices. It is not that difficult technically, because the voices are very close to each other; but of course voicing is very difficult, because they [the voices] are crossing each other the whole time and there are several main and secondary ideas, so you have to bring out the most important things out of the texture, otherwise you have a boring conglomerate.

V: So, in terms of memorisation. You spoke about detail. But if you want to play the whole Etude [by Franklin Cox]*, how do you memorise the whole thing?*

ET: I memorise the whole thing by memorising the smaller parts.

V: Then, how do you put everything together?

ET: Well, I work straightforwardly, like from page to page, or from unit to unit. I always try to think musically and page break is a random or practical fact. But of course, I try to think musically. But, if you know page one by heart, page two by heart, page three by heart, then you can make a run through in your head and then you take a deep breath and try to do this on the piano too. You play the piano, so you have certainly experience, in this moment you have to put all the individual parts together and start playing the piece from the beginning to the end.

*V: Exactly. So, for example, here [*Franklin Cox, *Piano Etude No.1], what would be a part? How would you divide this in parts? Page by page?*

ET: In this case yes, because it is kind of a developing process. You can see that the Etude has nine pages. There is no cut, there are no new ideas coming in. It is always about the same ideas developing and getting bigger. Also, the speeds are getting more versatile. That means, if this is the main beat [sang] then you have slower and quicker speeds within the time; so this is the simplest deviation and these are bigger deviations [showed on the score].

V: Ok, now speaking about the moment of performance, so when you are performing from memory. What do you think?

ET: Well, if I am really relaxed and I have played the piece more times, then I also try to think about other things. For instance what I am doing after the concert [laugh].

V: [laugh] During the concert?

ET: Yes, during the concert. But not only this; of course, then you have the luxury and the time to adjust to the acoustics, to work also on these special details that you can do only for this performance, to give this special feature during the performance. Before the concert, I go through the pieces many times, to be sure that everything is in place.

V: But, on the piano?

ET: Not on the piano. I try not to play on the piano on the day I have concert. Perhaps it is kind of superstitious thing. It doesn't matter. In many cases, I do play the piano, because I have a dress rehearsal on the day of the concert and I cannot arrange it another way, so I have to play the piano on the same day – and that's no problem. And it could also happen that I need to look at the score on the day of the concert. I try always to practice really enough so that there are no major doubts.

V: So, you enter on stage and you sit on the piano. What do you think?

ET: Let's start.

V: *Let's start* [laugh].

ET: Well, you probably have had this experience yourself; when you enter the stage you have already the first feedback of the audience, if they like you. Well sometimes you play for audiences that know you and then it is like a party, like playing for friends, even if you don't know personally everybody in the audience. If you play in a venue that you have played many times, you probably know the audience.

V: Exactly. And in terms of memory slips, do you have any history of having any memory slip of forgetting?

ET: No. I have been playing in public for about twenty two years…twenty three.

V: Wow! Amazing! Ok, so just one last topic. I would like to talk about skills. So, what skills do you think a performer should have in order to be able to play and prepare contemporary music?

ET: Of course experience in this field is a demand, it is really important. An intellectual approach is also very important. You don't have to be a theorist or a composer necessarily. But, even if you play a monophonic instrument, a violin or a flute, it is important to know about composition methods, systems and what atonality is about. And to understand the language of every music piece. I mean, it is important to know what features or elements of the part you are playing are really significant. It is really like understanding a language. I assume you don't speak Mandarin, just like me; it is still possible that we memorise poems in Mandarin and recite them also in public. It would take unusually a lot of time to practice this. Why? Because, we don't know the language. We are going to encode the sounds in our own ways and make our own associations, which will probably not have anything to do with the language. But if you know the language, then it is really simpler, much simpler.

V: Yes, it makes sense. Do you think pianists educational background prepares them to have these skills?

ET: Things are certainly better than twenty years ago, but not yet, really. Specially the piano is really a classical instrument. There is a lot of historical repertoire and there are still a lot of teachers and a lot of young people that want to only focus on it and are not at all into contemporary music. If I ever teach again – because I have not taught at all for the last ten years – I would like to try, to do an effort in this way.

V: What do you think needs to be improved?

ET: Well, the attitude, being open, the theoretical background and the listening experience. If you study in a music academy, there should be concerts of contemporary music and not only with works by composition students. People have certainly to get convinced about contemporary music, to see that there have been masterpieces after 1920, to demonstrate these pieces, to get the people to know them. This is what is needed, so listening experiences and some theoretical, intellectual background. It has to be both, only theory does not produce good results.

V: One last topic. I know you are also a composer. Do you think that being a composer influences your approach to this repertoire?

ET: Yes, but probably through this theoretical background that a composer has. I don't mix up these fields of activity. I don't compose like the pieces I play, I have my own methods, strategies and, as a performer, I like different aesthetical directions and I try to get into all of them, with what I have to play, with what I am asked to play. This doesn't mean that I compose like this, it is also not possible. Even if you are copying composers, which you are not supposed to, you cannot be, for instance, ~~a~~ Mark Andre and Brian Ferneyhough at the same time.

V: Yes, of course. Do you have close collaborations with living composers?

ET: Yes, the whole time.

V: Can you describe me some of those collaborations?

ET: Of course, the first one was when I was 14 and I played something of my first music teacher [Yannis Ioannidis]; he writes really in a progressive idiom for his time, with clusters. He also uses his own system with symmetric intervals We worked together and his piano music is one of the first recordings I did in 1995. And after this I worked with other composers, mainly based in Athens, and then I met Xenakis. We did not really worked together, he just came and listened to a recital of mine, his complete piano works. Later on I met Claus-Steffen Mahnkopf, who sent me a piece that he had written a few years earlier, but he never got it performed, because he gave it to certain pianists who refused to play it. But it was again a situation that we didn't have time to work on details, because I prepared the piece and he came to Athens for the general rehearsal, during which he told me a few things. But now there have been composers that have written pieces for me, for special occasions and concerts, but generally I am mostly not involved in the creating process. It doesn't happen very often that a composer comes to me with the sketches. I get a score which is finished, ready for leaning and playing and, depending on distance and time, we get one or more rehearsals.

V: So, what do you discuss in those sessions with the composers?

ET: Perhaps some technical things, some playability issues, some pedaling issues. I have worked also with composition students in Amsterdam, when I was a piano student. There were composition students, they had written an ensemble piano part, or a solo piece and sometimes composers don't really know how the sostenuto pedal works. They think, for instance, that you can have the right pedal pressed and that you can keep notes with the sostenuto pedal with the right pedal pressed. This doesn't make sense [laugh]. Or things inside the piano, some unexperienced composers try things inside the piano, on a specific grand piano model, thinking that it is going to work everywhere in the world and on every grand piano, but this is absolutely not the

case. For notation and technical things, I think, contrary to a lot of colleagues of mine, I let composers ~~to~~ be free. I believe that notation reflects the way a composition is, it is part of the composition. I would not ask or push composers to notate on a more pianistic way, or to press or reduce the notation into two or three staves. For instance, this is *Etude nº 4* by Franklin Cox, is notated on eight staves, and it goes like this the whole time. But this is the way he conceives polyphony. Everything is playable, everything is in the same range. And of course it is much more like a sketch here. He notates his talea patterns, this is how he conceives rhythm. I cannot follow everything that he writes, I cannot analyse the piece that thoroughly. But it gets much more dense and complex from some point. And then I started from page 7, for my own comfort, to write the piece like this [showed his own version]. This is page 7, this is page 8 of this piece. I rewrote this, but not completely, it was only to help me with fingering and deciding which hand is going to play what. And then I worked with both kinds of scores, simultaneously, because what I notate here is still pretty rough. It does not include the exact pulses, any articulation, or the exact dynamics. So, for instance, this is page 14, only this line. And this would be page 14 originally notated. For this extreme degree of complexity it is helpful. But I have to confess that for memorising the piece I have rather the picture of my re-notation of the piece in my head than this, but from the original I took articulation and exact rhythms and dynamics.

V: So, what is this piece again?

ET: This is Etude No. 4 by Franklin Cox. It is also on youtube.

V: I think I have listened to the recording. Just one last question. We were speaking about collaboration with composers. So, do you think collaborating with a living composer influences your approach to a specific piece?

ET: It depends on what they have to say. It is really very different. There are composers that speak much more about their theories and concepts of the piece and things that don't really have any influence on the way the piece should be played. Perhaps on the way the piece should be understood and then it might influence my perspective. On the other hand, there are composers that have composed the piece on the instrument, perhaps they are able to play the piece themselves and then they have a very concrete picture of what they want to hear and they want to have this reproduced. I think this can be problematic, but, of course it is their piece, if they want to hear it in this specific way, this is what they get.

V: Ok, thank you so much, this was very inspiring for me as a pianist as well. Is there anything else you want to say, or remember?

ET: Well, I think we covered some topics. And also beyond memorisation.

V: Thank you very much.

8.6 INTERVIEW TRANSCRIPT PHILIP THOMAS

V: First of all I would like to thank you so much for your collaboration in this project. I am a doctoral student at the Royal College of Music and I am working on the topic of musical memorisation, focusing on specific styles of repertoire. Can we begin?

PT: Yes.

V: I am very interested in interviewing you because you are a recognised performer of new and experimental music, you have performed works by John Cage, Morton Feldman and Christian Wolff and also commissioned new works to British composers such as Stephen Chase or Christopher Fox. Is this correct?

PT: Yes.

V: Can you just give me a little bit more detail about the repertoire you have been playing?

PT: Yes. Generally it fits within what we generally call *Experimental Music*. So, I suppose, music by John Cage and the early American experimentalists, and people who have been inspired by them, following this kind of tradition. I have played several English composers, and some music from the 1950s onwards. I think that I am pretty close to new experimental composers these days and from the last ten, fifteen years. And of course some of these are still living composers. I just did the second ever performance of a piece by Christian Wolff, he is 83. So he just premiered it on the weekend. Some of the composers are older, some of them are younger. But I suppose what tends to link them is that they tend to be quite undetermined in the notation, leaving certain amount unsaid. So very often I might be filling in the gaps myself or I am actually creating a new text, a new score myself, based upon their original notation. The idea of what a score is can be often quite provocative, as it challenges traditional ideas, what the work is. But alongside that I also prepared a lot of music by a number of composers who I think have been experimental, but perhaps some of these might not. For example, composers like Michael Finnisy, who makes complex music, Christopher Fox is fully notated music very often anyway, James Clarke, an English composer. I have played in the past people like Helmut Lachenmann, and Walter Zimmermann. It is very varied, but on the whole, I would say it has been in the experimental music market.

V: Have you also played more traditional repertoire such as baroque, classical, romantic?

PT: Obviously that is my tradition, my training, but I don't play it professionally at all. And yes, I have got Liszt on the piano at home, and I play it, but I don't play it in public. Very, very rarely. Occasionally there might be a program where it makes sense, for some reasons, to include this music. Maybe the music is based upon a piece by Beethoven. I did that once when Christopher Fox wrote a piece based upon some Beethoven variations. I included the Beethoven in the program there. But on the whole, there is no reason for me nowadays to play any conventional classical music, in public, in a program of its own.

V: And why did you become interested in contemporary music?

PT: Because I loved it. Simple as that. Really, it has to be that first of all. And of course, when I say I love contemporary music, probably the majority of contemporary music I don't love. There is so much out there, you know?

V: Yes.

PT: There is not such thing as contemporary music. Obviously there are so many different styles. I remember, when I was a student, of hearing Tippett and Messiaen, which open up doors for me. And as soon as you open one door, ten more doors open. I suppose, for a period in the nineties, I was absorbed in it all and playing everything that I could, Stockhausen, Berio, lot's of things. And then I think, since 2000, it is not as much as I close doors, but I became more interested in a particular kind of music. And it tends to be music by composers who I am curious about. Not composers who are trying to say something very specific or who know what they want to, and ask me to play it. It tends to be about me coming alongside the composer and us together saying 'This is quite interesting, what is happening here?'

V: That's very interesting. Now a different question. Do you play your repertoire from memory?

PT: No.

V: Not at all?

PT: No.

V: And more traditional repertoire?

PT: I had to, but again so long ago, that I have played it in public anyway. But sure, I used to play Beethoven and Bach from memory, although not very often. One very practical reason for me, related to memory, is the added nerves, which I find to be unhelpful. I think whenever you play any piece, the ideal situation is that you have memorised it, you have internalised it, that you know what is happening next, that you know the structure, you know the notes, you know where you are going, you know the lay of the land. When I play with the music in front of me, it is hopefully not because I don't know the music. You have to know the music, of course. But I do remember, in those times, when I did memorised things, finding the extra layer of nerves of just thinking, what if I forget? That itself being unhelpful, and so I tended not to do it.

V: Any other reasons, specifically in the case of contemporary music?

PT: I like notation. The thing is that, even though some pieces I could obviously really easily play without music, I love to see the notes in front of me, and it is almost the sense that when you see it in front of you, it kind of offers fresh ideas, fresh inspiration. I especially think that the handwriting is like a window into the music, for the soul of the composer maybe, but not always. Also with printed music, I like to have the opportunity to think that, in performance, I am still inquiring of the music, and I don't know it. Because there is a difference between knowing music in that way I described just now, which is that you want to get your hands to know it structurally, you want to know the notes, everything about it, physically, embodied. At the same time, I think music is always unknowable. There is always more, and you can't ever know it. And I wouldn't ever want to. If I get to the point to which I think that I know something, there is something going on, because I am not thinking about it, I am not inquiring. But I think everyone would agree with that, even if we both would be contentious about that. And everyone knows that. When you give a performance on a night, you are only given a version of the piece. I think that the difference is probably that, in some cases, particularly in more conventional music, and also by that I mean conventional contemporary music, you develop a sense that you are still working towards your own statement in this music, you are still working towards a version of the music that you built confidently, that you are able to project in the performance. But that is partly true. It is also true that I quite like the performance moments that suggest me this, so that I haven't got it all figured out. I want to be alert to something that might occur to me at the moment, and that might come through the notation. It might come through other means, just the response to my touch, to the piano, the acoustics, the audience, what I ate that day, any number of things. But it my also come through the notation.

V: So you have practicality answered to this question, but can you identify advantages and disadvantages of performing from memory in general?

PT: Well, disadvantages. For me, simply, I will get more nervous about something that I think has nothing to do with the music. So I feel like it is unnecessary, an extra layer of pressure. I just simply don't need and music doesn't need it. That's a disadvantage. I can see advantages. Notation can be a distraction, I guess, and I think the skill is making sure that it is not a distraction, that it doesn't get in the way. I think that is the skill. I get that sometimes, after having a busy day, I can focus upon what I am doing, rather than what I am hearing. And so I think that the advantages of memorising music is that perhaps you get rid of that intermediate thing and you really focus upon your touch and the sound that you are making. And I think that is the conventional argument for it. However, I just think that is something you learn. You can learn to listen and read [at the same time] and this is ok. The other thing is that, lots of music that I have played allows me great scope to responding to the notation. The other thing is that music is very complicated to learn by memory, so let's think about music that is very similar several times but not quite similar. I think about the late works of Morton Feldman, for example *Triadic Memories*. He has this endless shifting patterns, that are sort of the same thing, but every bar is different. I could go through lots of lengths in memorising that, but I see absolutely no point in doing that. And the notation, which is quite complex, often, rhythmically, just to respond to that rhythmic complexity…And I suppose that the danger of learning all by memory, is the danger of actually compromising on that rhythmic nuance, which I think notation always gives nuance. Rhythmic notation does not just tell you about rhythm. It tells you about all kinds of changes of touch, the way in which a note relates to a bar line. In Finnissy or the late Feldman or Bryn Harrisson, when you have a similar type of music, but on a ratio of 6 on the top of 7 or 8 on the top of 9, or 13 on the top of 12, all those nuances are just a shift to just say to hold back a bit here and there. It is always changing. The notation is a wonderful inspiration for that nuance. And then other things. For instance, long pieces, you have all these things to look for and think of the complexity of composers like Michael Finnissy. There is no way I could play that music without having completely internalised it physically, you know? I have to memorise it. But the notation also just gives you a flavour, it looks like something rich and abundant. You take that away and you kind of reduce to physical movements. I kind of feel that it might compromise that sense of multi-layered complexity, abundant. So, I think that is the disadvantage also for me. You reduce the complexity of things, because you are having, over time, to rely upon a physically memorised thing. I wrote an article many years ago in conjunction with Nick cooke and Eric Clarke, you may know the article.

V: Yes.

PT: It was a long time ago. But I remember, one quote keeps coming back, because it gets quoted in other people things. Nick Cooke was interviewing me about the process and I said, 'I have to kind of keep the complexity of it'. And it's true. As soon as you make something familiar, it looses the dynamic and I want to keep making it

unfamiliar, to keep that level of attention, liveliness in the music. And having the notation there is a good way of keeping myself from that. Also, I played a lot of music by Bryn Harrison, *Vessels*, seventy five minutes long, it's almost the same all the way trough, but it's not, it's always changing. But it feels like it's always very quiet, it doesn't stop. It is just this winding labirint of beautiful counting, for seventy five minutes. There are times I am playing a bar then and it feels that I never played this bar before in my life. Well, not when I played the piece a number of times before, but earlier in the piece itself, that bar has popped out a number of times, but music thus plays tricks on you. And I wonder whether that would always be the case if I have memorised it. Maybe, I like situations in performance when something unfamiliar happens.

V: Yes, very interesting. Now I would like to focus on the process of learning, from now one. So if you want to give specific examples of some pieces, I don't know if you brought some scores. But what I would like to ask is what aspects do you focus on when you are learning a piece?

PT: Probably in some days it is probably different how I learn a piece. Some music is sight-readable. For example, tomorrow night I am playing a piano trio. I don't think I have got any solo music with me to show you.

V: Ah, no problem.

PT: Because I don't have them with me. So this is a piece for cello and piano and is just single notes, so do I need to go through all that? No. So I am going to sight read. I don't want to know it. I have checked if there is anything that can catch the eye and there isn't. So, I will actually be playing it for the first time ever tomorrow night in the concert with the cellist. And so, things that look like this I will make sure I will have understood, it's much more important to know what my approach is going to be, what do I know about the composer, what do I know about their aesthetic, what kind of touch I might use, what am I going to be listening to, how is it going to affect the way I play, when I play, how I play, all those kinds of things. So all of that is done away from the piano. There is no need for me to play it. And, by the way, there is another piece here that I will give its first performance tomorrow night. We will rehearse as a group, but it's very easy chords, so I have gonne through a few things, I have written in some things that might catch the eye, some rhythms. Occasionally I have noted the hand distribution, I have written a couple of fingerings. Basically, I have gone through it just to make sure that I know that it is all doable. But I don't want to practice it very much, because I want, as much as possible, to keep music alive. First of all, I have said, you want to perform the music, not replicate it, and we don't want to think 'here is something that I have been practising and practising and now I am going to duplicate that experience for you, but in the concert hall'. I want music to be tangible and alive in the performance. In works like this, which are

simple, I will not practice very much, because I want them to be as close as to improvisation as they can be, even though they are fully notated. But in other things more complicated, let me give you an example. I am going to give you a true example. Here is what I am playing tonight. It's a piano concerto by Christian Wolff. First performance of *Resistance*. So, what have I done? I have written a bit of fingering where it needs to be. I am writing impracticalities, I am learning things that need to be figured out in advance. But a lot of this is uncertain. I don't even need to read that in any particular clef, that could be in either clef. I've got a noise in there, I have to make decisions as to what noise I might make, but there is a lot that is open in business. I might play with different possibilities, I can read this is in either treble or bass clef coming the day of the performance, I can be flexible. So I will work out these options [in performance].

V: But *do you usually choose an option and stick with it?*

PT: No. I will try out both. I will make sure I can do both. So, I have just written it some fingering. I have just writen in practical things, make sure I can do my fingers. This is fast, I don't want to be coming across that for the first time in performance. I want to make sure I can do it right. But I haven't written in dynamics. Sometimes, with some music, because this is indeterminate music, there is a lot that is open.

V: This is your score.

PT: So, I have made a score.

VF: Why did you feel the need to make your own score?

PT: You can't really read from the score. I did a 15 minute version, so I needed to write it up. This is 15 minutes of music. One of the decisions I have made was related to dynamics. Most of these dynamics are not necessary. I have used chunks to determine every dynamic. Why would I do that? The reason is that I improvise quite a lot and I am fairly confident playing this kind of music. I also find that, even so, it's very easy to use dynamics from *mf* to *mp* and I want to make sure I am using the whole spread. Sometimes just using chunks, sticking dynamics, a couple of those things. I would probably would have never thought of playing that *fortissimo*, but I am a whole pianist, I am going to here because I have applied that, so it's just a way of, again, keeping it alive in performance and also stopping me from reducing something to a kind of average, which is the same point really about the rhythmic notation that I was saying earlier. I don't want to reduce it into something that is familiar or comfortable, that is embodied. As soon as I do that I don't trust myself so much. That sounds harsh with someone, but just simply means that, it is so easy to make things familiar, specially if you have been practising for a while, you know? And then you forget the source. You forget the options that are available to you and I

want to make sure that I am aware of the options that are available to me. Mostly, practice is related to practicalities, because a lot of the music that I have played doesn't have so many traditional ideas about shape and gesture, phrasing. This is a big thing, this is a big contrast between traditionally what we do. Often when we play music, we are developing an interpretation such that it becomes this familiar and it begans this sense of shape, of line, of narrative, of phrasing. Then, in performance, we are projecting a conceptualization of a piece of music that we have embodied, we have understood, we know that it is not the way to play it, but it is our way, we have come to this agreement with ourselves. That is what I would say is true for classical music right through to most contemporary music of today. However, it is not to most of the music I play. Most of the music I play is often focused on non-continuity, disruption, fraction and maybe similarity where phrases are non-sensible. To that end, I focus upon the job that needs to be done. I focus upon attack and the quality of my touch, each moment rather than the connection of moments. I think that it is something that has changed a lot for me over the last fifteen years. Well, you know, I was used to come up with an interpretation. Now I just don't do that anymore. Occasionally, I find myself playing the music and focus on what needs to be done and it shocks me, because I have to recall a practice that I used to be involved with fifteen, twenty years ago and it feels fundamentally different from most of what I do now. Again, Christopher Fox, the piece *L'ascenseur*. This piece starts in the bottom of the piano, another 15 minutes, and ends up at the top. It has lots of rhythmic patterns, that just rise. That is one phrase. The piece goes from bottom to top. I am not thinking about trying to make it into phrases. When we try to make something into phrases, what we are trying to do very often is making it familiar. We are trying to make something that is unfamiliar into something that is familiar. But I don't want it to be familiar [laugh]. As soon as I bring phrasing into it I am probably turning the music into something that is always appropriate and this is not how I play it. And I am not saying that this is an entirely valid approach to music, but is not particularly what interests me anyway.

V: For example Cage's Piano Concerto. Do you remember the first time you had to learn it, what was the first thing you did?

PT: It's such an unusual piece. It is a sixty three page score and I know, straight away, that I can't use that score in performance. I am going to have to make a version. The first thing I do is to make the call about how am I going to make those versions. Which parameters am I going to follow? I might make kind of a loose score, take suggestions from the score, but leave lots open to performance, or I might strictly notate everything that makes it fixed. Actually, in Cage I fix things, but then once I play it I don't play it again. So I don't fix it for life, but for that performance. In the next performance I will do it again. That is not always true. For instance, tonight I am playing the same version I played four days ago, because it took me months to make

this. So, if I am doing performances in close sessions I will probably use the same score. If I do it again in six months time or years time, I will make a new version.

V: Do you make the version while you are learning or before you start?

PT: No. Entirely before. For instance, I made this version of the piece. Then, it is just like any other music. I sit down on the piano and I start learning. And if you ask me, 'where is that bit in Cage's score?', I couldn't tell you. I could, If I got to look it up and talk and figured it out, I could tell you, but I am not interested because this is not my score. That is a different thing. But Cage is a particularly unique case, I think.

V: Why do you say that?

PT: You don't have to do this so often [with other composers]. Normally you will follow the composer's score in some way. You only have to do this in particularly graphic notations. And even then, in Cage's graphic notations, there are often graphic scores that are much more improvisation and, in that case, I will still use that score. I will still use it as beginning to an improvisation.

V: You did your own score. Now you start playing, what do you focus on in those practice sessions?

PT: Really tedious. I start from the beginning, I go to the end of the line, I learn the notes. I think about dynamics, I think of timing. If I can't play in time I just start slower and build up. That might take some time. Usually I practice a new thing that day. The next day you start learning a new thing and you revise the old. This is as simple as that.

V: How do you usually divide the study of the piece?

PT: Because a lot of this music is not about creating phrases and sections, I tend to just go from the beginning and then read through. And obviously there are bits that are easy to remember. I will focus more in successive days in the more complicated things. For instance, this piece has three really difficult pages there. So, I just practice those pages over and over again and I will do it slowly, numerous times slowly, and then I will take a deep breath and go forward [laugh].

V: Yes, that is very interesting. And for example, one week before the performance, what were you focusing on while practising?

PT: Yesterday I just focused on difficult bits, doing them slowly again. Just to have my hands in there. Everything is there in the notes, so I just focus upon playing mechanics, physical, it is like work. This goes there, this hand goes there. Just learn

the choreography. Thoug, as soon as you start learning the choreography, internalising it, again, it becomes familiar.

V: Before we continue, can you just give me a different example of a piece by Michael Finnissy or Morton Feldman?

PT: I can give you a different example, but it is the same thing. I just focus upon that, mechanics. But a lot of the time I think of music away from the instrument, so Michael Finnissy's scores. When I am at the piano I look at really just physically learning the notes and playing them and get my fingers in place. But, away from that, I am always thinking about it, thinking about what the music is suggesting. And in Finnisy's music you often have that character. I might think, 'is this related to a particular kind of music?'; 'Does it references another kind of music?' Or I might be thinking about this being explosive, or tender or lyrical. Those are quite traditional ideas and that seems to me to be appropriate for Finnisy's music. I am thinking about those things away from the piano. I love this sort of music, I have read these composers' works. I am really inspired by what they say about music. So I already got that relationship whether I know them or not. I never knew Cage. So, there is a relationship there. So, I have already got the framework with which I am working with. Very often then, those things are colouring how I play because of the nature of their inquiry. I know that also very often I have to just focus upon the work that needs to be done. You can't reduce music to a simple flow chart, can you? It's how you process it. Every time I think about an answer I am giving you, I think, 'well, this is not quite true.' Because it's complex. I don't want to give you an answer that makes me think, that is how I do it. Well, it's not quite like that, is it? So, I suppose, sometimes I just need to focus upon the work that needs to be done and then I trust that the music comes out of that experience. But, also, the way I am doing that work has been informed by my knowledge and understanding and love of them, so there is a rich collaboration even though I may not speek to the composer. There is still collaborative thinking. I am thinking about music in other ways. I am thinking more in terms of character and about quizzing and I challenging myself in asking, 'is that the one?' You go on a journey and you are always thinking about the music, you are always thinking about the ways to conceive music. There is no simple way. I think the majority of the time, at the piano, I am just focusing upon the work that needs to be done, that is about fingering, choreography, why each hand is going to take which note.

V: What do you mean by choreography?

PT: Just that. Which hand is going to take that note there, how do I move to that note, is there a better way to get into that note in time, things like that.

V: Any other example you would like to talk about?

PT: Solo? For instance, Feldman's music is fairly straightforward. There are some difficult bits at times, but a lot of the time it is sight-readable, so I am trying to perform at the instrument in a way that I imagine I might do it in public and I am allowing the music to perform itself, just allowing it to be thought about it. Other music. This is a piece that has just been composed for me. I have just printed that of and I have not played a single note of it yet, ok? So I don't know [how I am going to do it], but I know the composer. It's Christopher Fox, but I am giving the premier of it in November. So, I have printed it of so I can look at it and I will keep looking at it over the next few days, a week or two. But I might start playing some at the piano and then that will be a different thing, because I will be listening to the sound. So as you can see there is not much there, just notes, chords.

V: So what are you looking for when you are looking at the score?

PT: I am thinking, 'What am I going to do with that?' 'What are the parameters within which I am working here?' 'Is there anything that I think that might be inappropriate?' What are the extremities I could imagine playing this music? So I might think about speed, that is an obvious one. How slow am I going to go? It's called *senza mesura.* There is no tempo. There is nothing there. So I have got no dynamics, no tempo. So, I am thinking, ' How slow could it be? Could I take an hour over a single line?'

V: How do you make those decisions about tempo?

PT: I am thinking about, in an open world, what could be done with it, because there is nothing there that could suggest me, at this moment, that I could not take two hours over the first line, right?

V: Yes.

PT: And then when I come and try to play it at the piano and I try to take two hours over the first line, I probably won't do it. I mean, these decays are lovely, but maybe that is just too much. So, what are the extremities of this? Maybe I should play it fast. How does it sound? Probably, with this piece, it's all a matter of practising it fast. I've got that possibility open to me. So, I would imagine, if I was to play it fast, I might not hear the resonances so much. So thinking about what the options are, anyway. Dynamics, I can imagine playing this with constant dynamic all the way through to allow the focus not upon me, without trying to add some kind of dynamics magic to it and adding my own creative ideas to it, in a way that might come back quite as a cliché. If I kept the dynamic the same that would be the focus. If I try to change dynamics all the time, I am revealing something else, maybe I am revealing how clever I am to use lot's of different dynamic marks. That seems to me to be not so

interesting. I am not interested in showing that I care more, but the piano and the sound are used quite fairly. Sound is always interesting. I am not always interesting, so maybe I just focus upon the sound. In this piece you also have these two marks, whih suggest different types of attack. So, in a sort of way, I will probably really explore touch. That would be absolutely decided at the piano. I am not just going to think about that away from the piano, I am going to be thinking about through my fingers, on the keys, listening to those hammers of the strings, and listening to the variety I could get there. So then it's really about me and my instrument and just trying to find ways that surprise myself, playing in a way that makes you: 'Wow! I never thought that the same chord could sound so different at the same time!'. That is what I want to try and explore. I always try to find something new about me and my technique, about my instrument. It's exciting then, because you want to learn it.

V: Is the piece always the same?

PT: Yes. The composer is coming tonight so I will ask him, but I think I don't have to play it all, it's one or two. So I might play it in different performances. I can play different pages, different lengths. So the other thing is that situation about practically. I will probably be playing it in a program with music festival and maybe they don't want my performance to be too long, or they don't want me to go too short, I don't know. There are many practical things to have into consideration in this case.

V: In this case you don't know, but the other pieces you were showing me before, how long did it take you to learn them?

PT: It's impossible to answer that. A very simple answer is, the more notes there are to learn, the more complicated, the more difficult it is to know the music, the longer it takes. I know that sounds classical. This does not necessarily mean that there is a correlation in terms of thinking time, conceptual time, dream time. I might spend a lot more time thinking about this piece than I would about things that are much more technical, but I might not think so much. So Christopher Fox's other piece, *L'ascenseur*. It goes from bottom to top. I don't think I thought a lot about that piece. I just worked on doing it. In this piece I am more thinking about what I am doing and less doing it, but I suspect I know what I am doing, because as I said I really want to test that sonority. Music that is difficult like this just do it over and over again.

V: I don't know if you remember the period when you were also learning more traditional repertoire, but is your approach to these pieces similar to the one you used with more traditional repertoire?

PT: I was a different pianist back then. So it is difficult to recall. But I think I was really thinking a lot more about shape in those days. That was a real change for me, and that is really attached to the repertoire that I play. It's not that so much has

changed in me, so much has changed in the repertoire I chose to play, which is obviously a change in me, but I think that, if I was to play Beethoven again, if I decided, 'ok I am going to learn a Beethoven sonata next year', I would absolutely be thinking a lot more again in terms of shape and I would do reading and scholarship about what to choose and question everything. I am probably also a better pianist now in terms of my sight-reading. So things will come quicker to me at the piano than they used to, I would imagine. But I would still be thinking in terms of shape a lot more. And also the unfamiliarity term. Again, I am playing this by people I know, so there is a familiarity. When I first started playing Finnissy's music I didn't know it so well. His pieces took me a lot longer to learn, but I know it now. My technique has changed. I know how to play rhythmic ratios like 18 in the space of 5 or 16 in the space of 9. So that doesn't take me so much time, just familiarity as with anything.

V: Now, in terms of memorisation, I won't ask you for this type of pieces, but do you remember when you were playing the more traditional repertoire the strategies you were using to memorise?

PT: Yes, it was a mixture of making sure I could think of the whole large scale piece and the small scale, harmony, short phrasing, medium scale phrasing and large scale structure. It's a combination of all of those things. You have to do that I think and making sure you really know what fingers you are using, so that nothing catches you unaware. But that is true when I play with the music anyway. You just need to be that much more aware of those things when you are memorising. I don't even know if you need to be more aware of it. As I said, the main difficulty when you are playing from memory is that you are just going to think 'I hope I don't forget'. That is what I was thinking. And I don't want to go to a concert thinking 'I hope I don't forget', because that just makes me forget [laugh]. You know, I think those things I just said about small scale, large scale, medium scale, that is true of learning with the music anyway.

V: Now, let's talk about the moment of the performance. What do you focus on while performing these pieces?

PT: I am trying to listen to the sound. I am thinking about the moment that I am in, but if I am honest I am also thinking 'ok, that bit is over', or 'don't forget a couple of notes over the next page', or 'what is that person thinking over there?', 'did I just see someone when I bowed in the previous piece?', or 'why did I choose to play this piece?', or 'oh, I really love this piece!'. I am thinking of all those things as well. Maybe a lot of people are that musical maestro, completely in the poetry of the moment. I actually find poetry in every day life as well, don't you think? I don't like to separate art from life, but if I have to be honest, I am thinking about real world things as well, or I am coursing myself, because I didn't get that bit right. And no matter how many times I tell my students, once is in the past is in the past, move on,

keep going, I am the same as them. It hurts when you get something wrong and you just want to kick yourself [laugh].

V: I understand.

PT: I am being honest.

V: Now, can you tell me about the experience of playing with the score? So, on stage, for example, how do you deal with the score, with the page turning, for example?

PT: If it's complicated I really practice where I am page turning, or often I have loose pages that I can slide over in some convenient point earlier in the page. I think the majority of the time I am not page turning at the end of the page, I slide over. I find that a better way of doing it. If I can't I have to have a page turner and that is fine. I don't mind having a page turner, that is fine. I like scores, I like music notation, so it does not work as a distraction for me. I really don't think it does. It has been a long long time since I remember a time when I looked and suddenly though 'where am I?' . I haven't done that for a long time. I can't remember the last time that happened. I do remember that it used to happen to me. Sometimes the score is not very well printed, or the page turner misses a page, or the music starts slipping if you have got a slide in the music stand. Those are scary moments, frustrating moments. What can you do? [laugh]

V: Two last topics. One is about skills, what skills do you think a performer should have to be able to learn and perform contemporary music?

PT: Not by memory? Just learning the music?

V: Just learning.

PT: Sight-reading. Good skill, great skill. I mean, what is technique? Technique is about getting read of the obstacles that get in the way of you being able to do anything, isn't it?

V: Yes.

PT: So whatever you are finding tricky, find a way of getting read of that, mentally or physically. If that is getting in the way of you doing what you need to do. Other skills in contemporary music. Don't play any music that you don't like. Curiosity, love. Those are not skills, but attitudes. And, you know, it does get easier, certain scores that used to be sort of forbidding end up becoming less forbidding. This is a matter of familiarity. A good skill is to try it out, so getting used to play it, getting used to play the scales in different keys. I always play my scales in different keys, whilst I am

playing B flat minor I am doing with my left hand D flat major. They are too close, aren't they, those two keys? Things like playing them with different articulations. Making sure that your hands are as independent as possible, so those are good skills. I suppose that you can move in different tempi, that is going to be helpful. And just exploring touch, recognizing that the piano is a hammer in the string, so how are you going to hit the hammer on that string. Exploring different kinds of attack, going as quiet as you can, exploring different kinds of *forte*, articulation and then you have got other parts in which you are playing inside the piano, things like this. Well, that is something that just needs to be learned. Some techniques like mute, pluck a string, have anything to do with piano playing. When you are plucking a string inside the piano that has got nothing to do with what you were doing and learning in the piano. To start, what you have to do is to sort of learn how to use your fingernail, where to pluck on the string, and you have got to learn about harmonics and different logic of standing up there, different things that you didn't apply to the piano, all of that is just being curious.

V: How did you learn that?

PT: By trying things out. Basically that's it. And also going to a lot of improvisation gigs and watching musicians, all kinds of instruments, what they did and just being inspired by creativity.

V: Do you think our educational background prepares us to have those skills that you were mentioning?

PT: Traditionally no, I have to say it doesn't. Some things are changing. I think, on the whole, the majority of instrumental tutors in conservatoires are probably not very experienced with contemporary music and, if they are, it is probably a lot at their own desire. This is not always the case, of course, but the majority I would say yes. And so that is a situation which doesn't help, and still very much is the case of an individual being curious and finding things out by themselves, figure it out. That's how it was for me, but I still see that is the case nowadays. I think it is different. For example, at universities, there may be a slightly more wide range of musicological culture, which might speed things up with music then in conservatoires, but I think there are lot of different things changing. The Royal College and the Royal Academy are more interested in music groups at both bases and that is great. Is just that the actual teachers, the tutors itself are just still generally fairly conservative, because the repertoire doesn't get extended.

V: Now, one lost topic about collaboration. You were mentioning that this is a huge part of your work. Can you describe some of your collaborations?

PT: Yes, I would actually say that I am still really quite traditional. I love it when the scores come in full and I place them on the piano and I say 'what am I going to do with that then?' That, for me, is when the collaboration starts. In this case the score is this thing that the composers have done, I have it now with me and now I am going to figure it out. On the whole, I try not to ask the composers very much. I like to figure things out for myself. And because of the music that I play and because of the composers that I am interested in, I will see what I can do with it. I tend not to play much by composers who do say 'play like this', 'do it like this'. I am not interested in doing that music very much. And so I tend not to do much actual collaboration with the composer in the process of the composition. For me collaboration happens when I have got this score, which is this intermidium, so this score is one element to the conversation. But of course the collaboration has taken place, as I said, through me knowing the composer. Therefore, being interested on what they are doing, whether I know them or not. And I always thing there is a collaborative dimension.

V: Yes, but with composers that you know and you can meet in person, how does the collaboration work?

PT: Sometimes, honestly, they might turn up on the day of the concert, to hearing it through. They might just say a few things. They might be clever. Maybe in a conversation after the rehearsal, they might tell me something about their piece. And afterwards I think, well, they want me to play it like this, but they didn't quite say it in that way. That's clever. Sometimes I have got something wrong, I might have played the wrong notes and I haven't noticed. This is why I just tend not to play music where the composer would say 'no, it should be like this'. I just don't do that.

V: But for example this new piece by Christopher , how do you think it will work with the composer?

PT: I probably got some ideas, I worked through it for a while and then questions may or may not emerge. If questions do emerge, I will ask him. If questions don't emerge, I would say: 'do you want to ear what I am doing?' Then he says yes or no. If he says no, I play it, and he will be curious. If he wants to say yes then I will play as expected and we will see what happens. That's how it will work.

V: How do you think these collaborations with these composers influence your process of learning these pieces?

PT: I actually have been speaking to him about this piece, then it will only be affected by a few things that he have said. Maybe things that he have said about what he was thinking about while writing this piece. It might be about things that they said specifically about the way of playing. Then I will work with it. It is typical.

V: Ok, so, I think I have asked everything. Do you have any other issue you would like to talk about? Something you remember?

PT: No, really. I will tell you one funny anecdote. I just remembered that Berios' *Sequenza 4*, I think have written about this.

V: Yes, I think I read that.

PT: I was memorising that piece. The last piece I think I have ever memorised actually. And in my memorisation, I was practising one day, then I suddenly realised that I have missed out five or six pages or something and I carried on like if it was nothing. I haven't stopped. I carried on, but I realised that anything I played was incomplete. I looked back and I realised that the structure, his music, is very similar, quite the same, and I haven't even picked up on it and I have jumped to the second place it did occurred when I played it for the first time. This is funny. There is something about the structure in his music which was not nearly obvious to me and revealed through my memorisation.

V: Yes, was that very close to the performance?

PT: I cant remember, somewhere in the learning process.

V: Did you perform that piece from memory?

PT: I think it was in about 1996/1997, twenty years ago, and I think [I played from memory] for the reason that it is traditionally done. I am a pianist, I am expected to play things from memory. There is no other reason I can give. I can't think of any good reason now, why should I have done it by memory. I wouldn't do it now.

V: Yes, but do you remember more or less the strategies you used to memorise it?

PT: No. It's just the same as the things I have said, short-term, mid-term, long-term.

V: Ok, any other thing you remember? It was quite complete.

PT: No.

V: Ok, thank you so much for your time!

9. INTERVIEW TRANSCRIPTS STUDY 3

9.1 FIRST INTERVIEW EMMA

V: First of all I would like to thank you so very for your collaboration in this project. We are doing this interview because you have accepted to participate in this study on memorisation of Berio's Leaf. Before we begin the study, I would like to know a little bit more about you, your background and how do you usually learn and memorise music. Do you have any questions before we begin?

E: No.

V: Can you tell me a little bit about yourself? About your music studies?

E: I started studying music when I was nine, then studied in a music school, then went to Geneva to do the Bachelor and now I am doing my Masters.

V: What repertoire have you been playing?

E: In academic settings, of course, we are required to play repertoire from all styles, but definitely the one I am more attached to is from the 20th century, not contemporary, but from the beginning of the 20th century. Lately, I have been in a process of exploring music from the second half of the 20th century, which is not contemporary, but it is already quite recent. For example, I am studying right now Frank Martin, which is a composer from the seventies. Also Lopes Graça. I like to play Bartok, Prokofiev, Kabalevsky, Poulenc. I also like to play Ravel, Debussy and this type of repertoire. I like to play Falla. I never studied Ligeti. I will study Ligeti for the first time now, because I actually want to do it now. There were some times when I have played contemporary music, from student composers. Also contemporary pieces required in competitions. Also, recently, a piece by Luis Salgueiro, which was also contemporary. I played three pieces from this composer. I have also played contemporary chamber music, namely Berg, with a singer. I never played any solo piece from the Second Viennese School. Only chamber music. I don't have the experience of studying repertoire of this type. Even the more contemporary that I have played, the writing is very different, actually quite different from this *Encore No. 2* [*Leaf*] by Berio. Probably the most similar one is Luis Salgueiro, but I also never played it from memory. I knew it from memory, but I never played it. Maybe now I will play the Frank Martin from memory. This is a process [laugh].

V: This leads to my second question. Do you play your repertoire from memory?

E: I usually play from memory. Solo pieces almost always from memory, except when they are more contemporary. I think the only situations where I have not played from memory were precisely pieces from student composers. Some I played from memory, but pieces from student composers and the one from Luis Salgueiro and chamber music I didn't play from memory. I never play chamber music form memory. I usually play from memory, but contemporary no, because I am not totally used to it. In contemporary music I don't know very well how to memorise. I don't have references.

V: Why do you play the majority of your repertoire from memory?

E: First because of standards, because usually people prefer to see pianists performing from memory. This is a very bad answer [laugh]. But then also because I feel freer, I think I listen better to what I am doing when I am playing from memory. I can focus more on listening. Also, I think my expressive range increases a lot. On the other hand, each time more, I prefer to play from memory because sometimes the score gets in the way, because I am not used to look at the score and because there are moments when I know from memory and others that I don't. And what happens is that, when I don't know from memory, I have to look at the score and sometimes I don't look at the right place and that gets in the way. I am afraid of that. So, I prefer to memorise everything. Of course I always try to keep using the score during practice, even when I know it from memory. I perform most of the time with the score, even when I have the piece memorised. I try to know very well the visual memory parts of the piano, but I know that several times I have to look at the score and that makes me nervous.

V: And in contemporary music, why do you play with the score?

E: Because it doesn't have tonal chords, basically. This is very basic. I memorise several times by the harmony. Each time more I memorise by using harmonic mnemonics, and I have noticed that this has accentuated, because my memorisation power is getting worse. I don' think I have the same easiness than when I was yonger and when I didn't think about these things. And now I have to think about so many things when I am memorising. One important component is precisely harmony. Sometimes I don't need to think about the harmonic solution, but think what type of chord I am playing (seventh chord, for example). Of course I think several times about harmonic functions, but most of the time I am not even thinking about that, I am more thinking about the chords, if the composer does a modulation here, or a modulation there. In contemporary music I don't always know how to memorise. I don't have those references and some times I memorise in a very geometric way, by focusing on the piano design or on the salience of black or white keys. I need to visualise that. I am not seeing a specific chord, a seventh chord, or inverted chord, so this is why I have more difficulties. There are also rhythmic aspects. Contemporary music has a rhythmic variety and sometimes those little nuances are hard. It is hard to

memorise and sometimes they are not as clear. And many times you can't sing, because one way of memorising is to sing in your head and in contemporary this is not easy. For example, this Frank Martin that I am memorising. Sometimes it is very melodic, but memorise the melody is much harder, because it is a very strange melody. It is very beautiful, but very different.

V: You have already answered some of my questions, but I will ask you anyway. Let's focus on how you practice now. When you start practising a piece, what is the first thing you do?

E: Yes, my methods have varied over the years, but most recently, the first thing I do is to always listen to a recording. This is basic, right? And while accompanying with the score. But then what I have done is not to start playing straight away, because I don't think that works very well. Before I start reading I always make sure I analyse the score, I define some things that I have to do and even the dynamics, phrasing. I am doing this more now because it is easier for me to read the music. I know that a few years back it would have been very hard to have this first approach, because I would be much more focused on technical problems. But I try to understand straight away the structure of the work, before I begin. I practice mentally, in order to realise more or less how it is. I often practice away from the piano, listening to someone's recording, just to have this idea of the piece. Then I start playing. Normally I don't do a quick reading. Of course this varies, but most of the times I don't do a quick reading. I know that many people will think that you should do a quick reading first, but I think that for me that is not worthy, because I know many things will be bad. I start practising straight away by sections. I do the best I can for that section. I see each section in detail. Basically, I never read an entire piece in one day. I will always see gradually, and do as much as possible in that moment. But I also have this concern of not getting too tired in my study. You need to find a balance, because I know that if I am tired that will not be good for my concentration and for my connection with the piece. And then questions emerge as you practice. I always have the concern of using several study tools. I always try to vary when I am studying a specific part. I always try to vary a lot. And now I also try to study with my eyes closed. I have found that this works very well. Then I also study with a chair to be completely relaxed. Studying without a chair doesn't mean I am not relaxed, but this is just to remind me to be relaxed. There are some times when I start concentrating in so many things and I see that I am tense. Then, for each problem and every question I vary more or less my method. I also like to study with crossed hands, but this depends on the occasions.

V: Why do you cross your hands?

E: This depends on the situation. There are some situations when this is completely impossible and has no utility, but usually that helps me in terms of technical coordination. But even other passages where I feel that I am tenser playing, this is a

way of making it more difficult so then it gets easier. This makes me more relaxed when I play the normal version. Sometimes I am worried about making it more difficult, because I am tense in that passage and this is a way of saying 'Ah, in the end we don't need to be as tense, because we have already tried things that are much harder' [laugh]. This type of thing. I also don't record myself very much, but this is not good. Sometimes I do it and this is when I am more at the final stages of my practice, because I also have a problem. I have in my house a piano that makes a lot of noise in the pedal. I don't notice when I play, but when I listen to it in the recording it bothers me. But I think this is very important. Maybe I will try and introduce that, but for now I don't do it because this makes me a little bit nervous when I am recording.

V: Of course. Do you use the same strategies in different styles of repertoire?

E: Yes, I confess that yes, because these strategies are technical. More in terms of getting relaxed, of feeling well with the piece. Ah, and also one thing that I do a lot and now I have forgot to mention is to practice away from the piano. Because there are some passages that depend a lot on repetition, on our motor and technical dexterity and some times I get upset from repeating that infinitely and when I see that these things are relatively simple I do this practice away from the piano, on the table, for example, because then I try to avoid too much saturation in my practice. Because you get to that point when you just feel completely sick of it. In order to make sure my practice is more or less pleasant, I think that despite everything when I see a passage and I see that there is a technical problem that I have to repeat several times, or at least more times than normal, I do it several times away from the piano and I think it works. In general terms I like to play on the table, because it makes me have a very superior mental perception, because I have to picture the keyboard, I have to picture what I have to anticipate, what I have to think there without listening to the sound and that helps me too. Now, of course it will be very different when we are seeing Mozart we rarely use pedal. And when we are studying Chopin there is always that part of the study where we are going to use pedal and this changes everything. So, this strategy is a strategy that does not work in this type of repertoire. And then, of course, when we are studying a Fugue by Bach, the analysis is different, right? So, obviously this will be a strategy that will change. This is something more analytical, more intellectual, more relaxing and this type of thing is transversal to all musical works. Of course then it depends on my ability and on my willingness to play that piece. I don't feel so comfortable with classical pieces, for example. So, my approach to classical repertoire needs to be completely different, like a psychological process. I also like to play *pianissimo* when I am practising. This works very well because I achieve better control. This helps a lot in the classical pieces, to play *pianissimo* and with the metronome, obviously. For me metronome is crutial, although maybe it is not always crutial for other styles, but in classical pieces is absolutely crucial for me.

V: And for example the piece by Frank Martin? Your practice approach to this piece has been similar to the one you have described?

E: Yes. It is also a large piece, around twelve minutes long. Well, more or less. For example, when learning the Falla I could follow better this approach I just described, but I confess that the Frank Martin was hard to read. It was difficult to read note by note and also I noticed that, when I did the second or third reading round, two weeks after, I realised that several notes were wrong. I think my approach was not as systematic in this case and I couldn't get such organized idea of things because of the musical structure of the piece, which is *Fantaisie sur des rhythms flamenco*. While reading I had to dedicate much more time to each bar, each system to ensure that rhythm and notes were in place. I felt the constant need to analyse the Martin before start playing, because I always had to look at the score and realise, 'Ah, this is 8/8, this is 2/2/3, this is 3/3/2 and to make sure that rhythm was well defined, 'Ah here I am not doing this rest correctly', for example. So the previous work of looking at the score was more marked in this case and I did this regularly because I saw that doing this work would predict the challenges that I had in relation to the piece, but also because I am not so used to this type of writing.

V: Yes, of course. I would like to focus now on memorisation. In general, how do you memorise your pieces?

E: Well, in general I don't have a well-defined technique for memorisation, unfortunately, because, despite everything, a few years back I never had too much difficulty in memorise. The difficulties I have have been more recent, because I think I have more difficulty in knowing everything in detail. But usually what I do is to memorise by sections. I select more or less sections. This of course before realising…I mean, there is a moment when I see that I know the piece by heart, right? And of course what I have practised and I know well from memory I don't need to see by sections. There are other things that I see that are not from memory and then I do it by sections.

V: Actually this is what I would like to ask you. In what stage of learning do you start memorising?

E: Well, this is also something that has been changing. There was a time when I tried to memorise straight away from the beginning and I think I continue doing this in relation to some pieces. Now I am not doing that, but I think that if I was playing romantic or even classical pieces I would do that. But because now I am playing more recent pieces I don't do that, although maybe that would not be a bad idea to do it. But yes, now I have more this concern of memorising after a certain point. And several times what I notice is that I have a very significative part memorised. The problem of trying to memorise from the beginning is that I neglect important details of the score.

And I think that this approach, despite everything, ensures that I am more faithful to the text than when I try to memorise from the beginning, because several times I memorise and then I don't look a the score when I am practising. Then, there are moments when I try to look at the score and I see, 'Ah, I am missing this'. So I have these problems of memorising from the beginning. On the other hand, the problem of not memorising from he beginning is that those parts that will become problematic in terms of memorisation would be better if I solved them from the start. If you leave that ambiguity there for a long time, that is not good. But then when memory problems arise I try to rely on visual memory of the keyboard, to imagine the keyboard and also through harmony, for example by focusing on the bass. I try to have present in my mind the bass notes because several times a big problem is the left hand. And then also in terms of shape. So, this is a mixture. It depends on the piece. I don't use as much visual memory of the score, more visual memory of the keyboard, because I think that pianists also use this memory, 'Ah, that part is in that place of the score', but I don't usually see the score in front of me. I know that many people see, but actually I don't.

V: Now, coming back to the French piece you just mentioned, will you use similar methods? Similar approach?

E: Well, I have the piece more or less memorised. What is happening is that I some times memorise through geometry and also through memory of how I place my hands, how I feel the hand on the piano, based on the distribution between black and white keys. And also by the intermediate notes. This is sort like a mnemonic. Then, there are certain occasions when you have rhythmic differences that I really need to make sure I know, 'here it is like this', 'there it is like that'. Then I have one variation that is not well memorised yet, but there I will have to be more aware of the melody. Again in relation to the intermediate notes. You have chromaticisms there that start going down and I will have to focus on that. The other two dances in the end are a little bit, because they are too melodic, I will do it more through melodic motives both in the right and left hand, because the accompaniment is also a little bit melodic, somehow, so I think I will rely on that. And sometimes I will also have to rely on intervals, this is a 5^{th}, this is a 4^{th}. Sometimes you have chords that are easier, other times more difficult. But this piece is full of chromaticisms in the intermediate notes, so I think this is what I will have to focus one.

V: Very interesting. In terms of how you practice and memorise. I think we have covered everything, but just one more question. Which skills do you think pianists should have in order to play contemporary music?

E: Well, first I think they need to have energy, your posture is somehow a little bit different, I think. I think it is more energetic than other music styles. This is my perception. Maybe other people will not agree with this. Of course Beethoven is also

super energetic, right? [laugh]. But that is more rhythmic, we need to have much more rhythmic and movement sensation, somehow. Of course it depends on the repertoire. You need to adapt. Then I think that pianists that learn this type of repertoire also need to have a lot of imagination, mainly for more contemporary repertoire, because I think we need to find a meaning. We need to have more imagination to find meaning in the score, because there is the risk of becoming too simple, just strange. I think the best way is to not only find meaning in melodic terms, but even in things that are unrelated to the music, more programmatic. And then definetly technical qualities, because the repertoire is hard. You need to have plenty of culture, from other repertoires more contemporary. Also interest, right? But that is obvious. And knowing how to select too, because I think some pieces are not so good and not everything can be always good, right? In the previous styles you already have a selection made, that other musicologists did for you and here you don't have.

V: And do you think our education as pianists prepares us to have these skills?

E: More or less. Actually, in my case, I was drawn to like contemporary music. When I entered the conservatoire I had a teacher of musical analysis who really liked contemporary music. He was a composer and showed us a lot of contemporary music. He was completely passionate about it. Back then, during high school, I already played music from my student composer friends. Since then I have been doing that. Sometimes you just to that in the university. So I think that, despite everything, in my case, even though my piano teachers were not too attached to this repertoire, the school environment provided the opportunities for students who had an interest in this music, so of course, in general, we don't listen a lot to this type of music and particularly little children.

V: Just one more question. Have you collaborated with some living composers?

E: I didn't collaborate much. There was a time when I recorded a piece by a student composer and we talked frequently about the subject and decided together on what to do. But it was not a collaboration per se. I recorded his piece and played his piece. In the other cases I just played in public and always with students. So basically this.

V: But this contact that you had with the composer. Do you think it influenced the way you have prepared the piece?

E: Yes, totally. On top of everything it was a very different writing, I couldn't even understand what was written. I think that in that piece it was essential, even for someone who would play it in the future. The composer would always have to explain the notes. The musical text would no be enough, at least I couldn't understand it.

V: Ok, so for me this is everything I would like to ask. Do you have anything you would like to add?

E: No, because despite everything I am not very comfortable with this repertoire. I am starting now, right?

V: Yes. We will meet again for another interview after the end of the study, after you perform the piece. Thank you so much for your collaboration in this study and good luck with learning Berio's Leaf.

9.2 FINAL INTERVIEW EMMA

V: Thank you so much for doing this study. It was very interesting to see you practising and congratulations on your performance. The first question I would like to ask, while you are still fresh, is what were you thinking about during performance? You just wrote this on this blank score after the performance, but can you explain me in more detail, please?

E: Actually I didn't think about many things, it was more or less automatic. Basically, what I thought was this [showed the score]. What I had more in my head was the soprano line, also sometimes also thought about the alto, but in general waht I thought was this soprano line because of the chromaticisms [sang]. So this type of things to know where I was. Then, right at the beginning I thought about these three beats, which is something that sometimes I was playing and I didn't know where I was. Also because this was the beginning and it is harder to be more focused. And then I thought more in expressive terms. In terms of organisation [I thought] here a new phrase and here another new phrase. And then, the only thing I thought in terms of memory was to do D in this part and Eb instead of E. Then I thought more in terms of remedy than prevention. I was thinking that it was too loud and then I tried to do it more piano. I don't know if worked very, well, I don't remember anymore. I know that in this passage I thought, I can't do so strong! So, basically this, not much.

V: So you also though about things like dynamics.

E: Well, not exactly. Basically I thought more about the soprano line. I thought about being more or less expressive, in a Berio way, but I didn't think...There is always a sort of playness in this music. But this was not something I thought on that moment. Here of course you have a slight diminuendo, obviously, but well, one thinks but also doesn't think at the same time.

V: When compared with other pieces that you have been, was the experience of performing similar?

E: No, no, no, no, nothing to do. Because other times I always think about tonal things and here I didn't think about anything. Here I think more in terms of hand shapes, or notes. More hand shapes, soprano line. Of course in other pieces I also think about hand shapes, but more about tonal structure.

V: Anything else you remember about the performance?

E: Ah, exactly! Here I should have thought about the difference between the syncope and the triplet, but I didn't...

V: This is in the second page, right? Bar 3 and 4?

E: Yes. In the beginning I programmed to though about this, but I didn't. I should have thought about it.

V: Was there any other place you had programmed to think about and you didn't

E: No, I thought that there was a place that I did a mistake early this morning and I thought that I should think about that in the performance, but then I saw that you didn't have to think about that. And then I though here that the end could not be too relaxed [bar 35]. During practice, because this a complicated position, I reached the conclusion that I should think that being relaxed does not help. But this is more a technical question, to actually make your hand a bit more tense. This is something that obviously we never think about. Usually you think about relaxing, but because this is not a very comfortable position you cannot be relaxed.

V: Very interesting. Now let's go back a little bit and let's talk about your study process. In general terms, how was your practice of this piece?

E: First I listened to several recordings, I analysed the piece. I did this rhythmic thing on the score [see Figure 25, p. 225], because the piece has too many rests and it was a bit confusing. So I wrote the location of the notes in the triplets and the semiquavers. I listened to it several times. Then I decided fingering. I studied more this last passage [bar 35]. And then memorisation was part by part. And then in the end I was just working on little details that were arising in every place [laugh]. Ah! Also, I tried to practice in a grand piano as much as possible, because the problem of this piece is that I was practising without studying with the sustained pedal and then when we go and study with the sustained pedal there is a different factor, that disturbs our concentration. So, in the final stage I was worried about sustaining the notes to always listen to that reverberation from the pedal, because you get used to one sound and changing the sound can affect your concentration because you are not used to it. And then I listened several times to other recordings. More or less this, the process.

V: For example in the first sessions. What were you focusing on?

E: Well, rhythm, especially rhythm.

V: Why rhythm?

E: Because I felt that it was a very importante part of the piece. This was one thing that was important to do, although in the end, because I focused on other things, I noticed that some things were not well in terms of rhythm. And that is a pity. This was because all the sudden I was focusing on other things. I don't know, in the beginning I focused more on the rhythm and then also in reading the notes.

V: And after this initial stage, what came next?

E: Well, I did this initial reading more or less at the same time I did the analysis. I think this piece is not too hard, so I could do it at the same time. Then I made some decisions in terms of interpretation along the way, but not too official, they were changing. I cannot define that very well in terms of stages, because things just sort of develop, more or less. Of course the reading part was hard, but I had the structure of the piece well defined before reading the notes, so I knew what I wanted.

V: And how did you define that structure?

E: By looking at the score and listening to recordings, basically this. And also having more or less an idea of what I wanted. And then of course I though about some interpretative issues, but also here, despite everything, there is not much...because this is very ephemeral, right? So, if I started being too expressive with it this would not even make sense, this is ephemeral, like a leaf falling. So, in certain moments I thought, I will do this more *tranquilo*, or less. Ah, also I focused a little bit on the physical part of it, because I was a little bit stressed studying and so I was moving a lot. So I thought about doing calmer. But then I reached the conclusion that I liked to do this, in some parts, to do more aggitated, despite starting calmer.

V: And in this last week, closer to the performance, what were the aspects you focused more?

E: More on this passage [bar 35] and then basically, this last week, I was more aware to eventual accidents that might occur. But this happens to me all the time, because I have this problem, which is, I think I have it memorised but I don't. So if I don't make myself anxious in my practice to fail and see what I have to work out. So in the last days of practice, there were still some things that were not there, for exemple in the second system. So I worked on that.

V: And I noticed that you did quite a lot of mental practice, right?

E: Yes, yes. That was very important. Actually that is essential for me, but this has also to do with the fact that lately I have not been too focused durin my practice, because I have been thinking about many things at the same time. I have phases [laugh]. So lately I haven't been too focused. Maybe if I was going through a stage where I was more focused it would have taken less time to learn. Anyway, because when I am more focused I can do mental practice while also playing at the instrument, at the same time. I can visualise while I play. Now, when I am not so focused I can't visualise when I play, so I need to do this work away from the piano.

V: Just one last question about practice. How did you organise your practice?

E: In the beginning by systems, but then by phrases that I defined, which are those [pointed to the score with the marked structure].

V: What I am going to ask you now is to please mark in this score how do you see the structure of this piece, if you see any.

E: Well, actually I see here a structure that might not be too conventional.

V: But that is exactly what I am interested in. So can you explain me?

E: [Showing the score]. This is a subsection, other subsection, third subsection...

V: Ok, so you devided by subsections.

E: Exactly, phrases.

V: Here, what is a subsection and what is a phrase?

E: It is almost the same. Now a teacher of musical analysis will come and will say, no, no, no, that's all wrong! [laugh] I am also not used to play this repertoire. But this is playful, despite everything. This piece is...of course there is always a sort of analysis that you have to do, but also there are a sort of carelessness.

V: Great, Let me confirm I have understood the structure [we looked at the score and discussed]. *Ok, I think I understood. Now, your practice and memorisation approach to Berio was the same as in other pieces?*

E: Yes, for now I have been doing like this. Of course I rarely play this type of pieces. The most recente piece I played was that *Fantaisie sur des rhythmes flamenco* by Frank Martin. But nothing to do with this. I did saw a structure here, but this is not an

obvious structure. In this piece everything was more extreme, because of the nature of the piece.

V: Anything else you remember from your practice?

E: Ah, yes! I almost forgot. Count rhythm is very important for me, not only rhythmically, but in terms of physical control. When I have problems in a passage I usually count. This has to do with automatisation in the piano part.

V: Were you counting during the performance

E: No.

V: When did this counting stopped?

E: Well, I restarted counting a couple of times this week. But I can't remember when I stopped counting, but it stopped when suddenly it was in my head. It was already inside of me. However, this was not always good, because I noticed that suddenly I was doing wrong rhythms. So I had to revise rhythm, as I said before.

V: Now just a little bit more about memorisation. In what stage of practice did you start memorising?

E: It was after I had the piece more or less, when I could read it from the beginning to the end, with the score. So, with my fingers. There are people who memorise before this, but I haven't done this. Also because now I have been having memory problems. I wanted to know the piece first and then memorise.

V: And what do you usually do with other pieces?

E: This is what I usually do. My older teacher used to say to me that I shouldn't do this, I should memorise straight away. Well, but then the effort just seems so much, I get kind of lost. So, I prefer to know very well the piece first and then I start memorising.

V: Any specific strategies you used to memorise the piece?

E: Analysis. Also, hand shapes, chromaticisms, both in the soprano line and in the middle notes. Try to define melodic lines [sang those lines], also focus on the bass line. I try to see if there is any connection. I like chromaticisms. For me it helps me a lot. I don' know, it works. And then hand shape. Or for exemple here feel the 4th finger [last bar, first page].

V: Anything else related to memorisation?

E: No, all analysis. I didn't use many strategies. I was not very creative [laugh]. Ah, here again, change of hand position [end of second page]. But I dindn't think about this in performance.

V: But did you thought about this during practice?

E: Yes. Even if you don't think, you need to ensure before that, even if you have doubts I will think about this.

V: Always the same question. This is what you do in other pieces? Other styles of repertoire?

E: Yes. It has been, analysis, thinking about little voices. More or less this. Ah! One thing I did a lot was to close my eyes, because it makes me concentrated. It helps me memorise. It is a physical question and I do that a lot too.

V: Now, we are almost finishing. Just one more question. Did you feel any particular challenges in relation to this piece?

E: Yes. It was challenging, because it is not a very expressive piece. I am not used to it. Even the Frank Martin is much more romantic. The pieces that I have played tell us a story. Here no, this is the same as illustrating a leaf falling in the autumn. This is impresisonist...well, not impressionist, impressionist is more expressive than this. So I was not used to this. This is like illustrating an ephemeral moment, but without a purpose really of showing an emotion or whatever. Of course this is my interpretation, right? There are other people who will properly have a different one. Even the structure. This has a certain structure, but is not a solid structure. I mean, you cannot even take it seriously. So, it's playful, like an ephemeral moment that Berio wanted to portray.

V: Last question. How was your experience of doing this research study?

E: [laugh]. It was weird, because I am used to have a lot of privacy. I think I felt a little bit. Sometimes I felt that I could not even think straight because I was being recorded.

V: Did that happen throughout the study?

E: No, no, no. It was more in the beginning. Then it went away. On the other hand, the recordings were actually good in a way, because they forced me to be focused. So it had two sides. But what happened, sometimes, was that I thought that I had to stop

the vídeo, just to think about what I wanted to do, because sometimes I blocked and just thought, 'What was I doing?' and because I have been distracted, this even made things worst. But of course I enjoyed because I got to play this piece, is very nice and this put me under pressure.

V: And the experience of memorising this piece?

E: Actually good, pretty good, yes. It was actually, 'I can do this!' It was not that hard.

V: Ok, so thank you so much for everything. Is there anything you would like to add?

E: No.

V: Once again thank you so much and we will keep in touch.

9.3 FIRST INTERVIEW SOPHIA

V: First of all I would like to thank you so very for your collaboration in this project. We are doing this interview because you have accepted to participate in this study on memorisation of Berio's Leaf. Before we begin the study, I would like to know a little bit more about you, your background and how do you usually learn and memorise music. Do you have any questions before we begin?

S: No.

V: Can you tell me a little bit about yourself? About your music studies?

S: I started studying music when I was four, playing the violin. I started piano when I as six years old, then entered the conservatory at seven and until then I have been studying the piano a lot. I started my bachelor in piano performance when I was fifteen in Zaragoza, then I went to Madrid. And now I am doing my masters.

V: And can you tell me a little bit more about the repertoire you usually play?

S: Usually, in all my short life, I have played classical repertoire from Bach to Mozart, Beethoven, Haydn, Rachmaninoff. Also Chopin and Bartok. Then more contemporary, I have played Falla, Granados, the Spanish composers. And until last year I had not played any contemporary music. Last year I had a whole year of contemporary music. So I had a private teacher in the conservatory, half an hour per week, just to do contemporary music. So it was the first time I also performed

contemporary music, also music for prepared piano. Of course compared to all the rest of the Classical repertoire I have this is not much.

V: Can you tell me more about the contemporary composers you have played?

S: I don't remember the names. Most of them were alive. But we did short pieces, several short pieces. I don't remember.

V: Do you remember how many pieces?

S: I have played six pieces in total.

V: *Six pieces, ok. And recently?*

S: Recently I have only performed Classical music, not contemporary.

V: What have you been doing over the past year?

S: In the summer I played some recitals. I played Chopin, Franck, Haydn and Bach and some Etudes.

V: Do you play your repertoire from memory?

S: Yes.

V: *All of it?*

S: All.

V: And why do you play from memory?

S: Because when you learn a piece, in the end, I don't find useful to have the score. I found it useful when I practice and revise things and at the beginning just to learn the piece. But when I play I try not to think about the notes. Sometimes you do, but I try not to and I try to focus on emotional cues and harmonic cues. So, in the end, it is better without the score because you get distracted sometimes. I don't play with the score many times, so I don't know if it will be distracting or not, but I think it will be. If I don't know the piece, of course I need the score. But if I know the piece, it' not better or worse…

V: Can you identify advantages and disadvantages of performing from memory?

A: When you play from memory, the advantages are: probably you are focusing on maybe what that piece means to you; maybe emotionally you are trying to communicate and you focus on what you want to say with the piece you have learned before. And if you play with the score, I feel like I will focus only on the notes and if what I am playing is right or wrong, so I feel like I will forget the communicative aspect, so that is kind of a disadvantage. If I play from memory, it is like the music is only in your head and what you want to imagine, so it's just, you have to project that into the audience, and you don't need the score for that.

V: So now lets focus on the process of learning. What do you focus on when your practising a piece?

S: First of all, I try to see how the piece is structured. There are maybe some similar parts in the piece, exact parts. Maybe the same part is transposed. When I get the structure, I then focus by segments. So I work by segments. Maybe then I go to other segment, then go back to first one and this way. I try to decide fingerings first. And then I try to understand what's happening, the direction of the phrases, if they use phrases at all, the dynamics. Then I try to find the emotional content of it. Usually when I think about it, it's later on in the process. And then I try to connect segments and work on these collections, also to connect them emotionally and I think that is it.

V: Can you give me a specific example of a piece that you have learned recently?

S: I have worked a lot this year on *Ballade No. 1* by Chopin and it's a really beautiful piece. I really like it. And it has really clear sections. In the beginning I imagine more that someone is telling you a story that happened before. It seems like it is in the third person and then when you start listening to the music, you start to get inside the story. So it feels like it's in the first person and you are living [the moment]. So it gets more tense and more agitated and a lot of things are happening. You are the main character and when the story ends, even if someone at the beginning was telling you the story, you end up feeling that you lived that story. Also technically [this piece] is difficult. It has some really quick parts in the right hand and jumps in the left hand and it's good, because it is divided into sections. You can have cues just to make sure where you start and where you finish. And even if something happens in the middle, you fail some notes or you just miss a jump in the left hand, you can continue listening to the harmony because usually it is second, dominant, tonic in a lot of tonalities. But you can find these cues harmonically from the structure, just to play it from the beginning to the end. And also, for example in the final coda, it's the main expectation of the *Ballade.* It's interesting, because you have a Neapolitan third and it's all the time the same, so in the end, when you gather the structure, harmonically speaking, it's not that difficult. You can play only thirds and it sounds good. So when you think in big structures, it's much easier.

V: And how do you work to solve technical difficulties?

S: Well, I have been studying with one teacher almost all my pathway. So I have a pretty centred technique and how to work with it. So I have a way of thinking of weight on my arm. If it is a *legato* part, I try to think about each note. Not articulated, but [to try to think of each note]. So in the beginning, I start really, really slow, making sure every note is really well pressed and imagine I have a point here so I press that point, every time. And then I try to have the sensation, quicker and quicker. So when I play quick, I try to feel this point here, all the time. This sounds a bit weird. Also, when I play slow, I try to put a lot of emotional content, like you are giving all of yourself. So when you play quick and you are nervous in [an] audition or something, you can go back to that feeling.

V: Can you give me just one more example of one contemporary pieces you have practised?

S: I played one, it was prepared piano. So I only could practice when I was with a teacher, because it wasn't in my home, so I didn't have a piano to place the objects. But I remember a different focus on it. Almost learning which notes go with, find segments that go together, try to find some melodic cues sometimes. Not harmony at all. And just try to understand a little bit in the end, because it was really weird for me at the beginning. At the beginning I was trying to learn the notes but it didn't work at all, so then I tried to find the same direction of phrases. I found it at the end, and some harmonic cues, not a lot. And yes, just to find that these notes go together, these together, and this [singing] and then [singing]. So things like that. Nothing C, F sharp, B flat chord, these types of things.

V: Do you remember when you got the score, what was the first thing you did?

S: Try to play it. From the beginning.

V: And then after that, what did you do?

S: It was kind of the same process because I'm used to working like this. So, little segments, and then try to connect them. In the beginning the teacher helped us to learn the songs, because it was the first year we were doing that. So she gave us cues to learn it. And we first did it in class and then by our own.

V: And do you remember, a week before the performance, what aspects were you focusing on, near the performance?

S: I was focusing pretty much on emotional content, because, at the end, I liked the piece and at the beginning not so much. I was more used to Classical and tonal music.

Then I found some beautiful affects, some affects, so I was focusing on that affect. Probably I failed some notes on the concert, but I got the [affect] of the sonority, and that was beautiful.

V: Did you use the same process of practice with the Chopin as the one you just described [to me] now?

S: Except with Chopin, I didn't try at the beginning, [o play from the beginning to the end like in this one. I just started working from the beginning. But it was the same process I just described.

V: Do you usually use the same strategies with different styles of repertoire?

S: Yes. Then I change the emotional content, but not the process of learning.

V: Now focusing on memory. In what stage of learning do you start memorising your pieces?

S: At the beginning. When I'm learning, trying to understand the piece, I try to understand how to play it without the score. When I was little, memory scared me a lot, so I worked a lot on that. I'm always trying to understand the piece, how to play it from memory.

V: And when you are memorising, what aspects do you focus on? What strategies do you use?

S: Well, it's a mixture of everything. The beginning, pretty much on technical aspects. I know that with this part I have to focus on this semiquaver, or these things. And also I try in harmony and then when I am more advanced in the process, I just focus on harmony and emotional content. But harmony is always there, because is also something that is inside you.

V: And taking a specific example. The Chopin ballade, for example. What strategies did you use to memorise that piece?

S: I sing a lot. I sing before I play, and then I try to play what I sang, when there [are] a lot of voices. I also try and sing internal voices. When I'm playing, I also sing the internal voices. And then, for example, when I'm trying to play a new segment from memory, I try to play it. If I fail, I just go back, revise it, try to find some cues to help me memorise and try it again. Also again by segment, connecting that segment and this same process, again and again.

V: And with the music for prepared piano? The piece?

S: It was pretty much the same. I think in the end I have these cues, like structure, harmony, emotional aspects, but I think these are the main. And even in contemporary music they can be there. The harmony maybe was a little bit more difficult to find a connection because I'm not used to this atonal music. But I think it was the same process.

V: And now focussing on the moment of the performance. So you are performing a piece. What do you think during the performance?

S: To be honest, that is a mixture. When I'm nervous sometimes I think, 'I hope this is going to be well', as that moment is arriving. But this happens, but I try not to focus on that. When I got the piece, and it's inside of me, I try to focus on the emotional content. So, in the first ballade, I have the first two C's [singing]. And I imagine an orchestra. The cellos playing [singing] and I do it a little bit longer, exaggerating. Even when I was studying, I exaggerate more, but when I'm in concert, I just play and try to feel that, and then something that levitates. I try to focus on the artistic thing more than the notes. And sometimes I think about notes, but when you are nervous there is no central thinking about notes, even if you think it helps. Probably not.

V: And with the piece for prepared piano. Was it similar as well?

S: Yes. Ah, one thing that I didn't say was that in the contemporary music, I played with the score.

V: Ah, okay. You didn't play from memory?

S: No, no, no. I tried to memorise it, but then we could play it with the score. We tried to memorise in class, and I tried by myself. But then in concert, I preferred to play it with the score, because it was difficult to memorise.

V: So how did you handle having the score in a piece for prepared piano?

S: It was still possible to have the stand in this case and go inside the piano. Also, I composed, with a friend of mine, for the contemporary class. We composed a contemporary song with prepared techniques. So that one was much of an improvised and experimental thing.

V: The other six pieces. Did you perform with the score?

S: With.

V: All of them?

S: Yes.

V: So you never played contemporary music without score?

S: Actually not. Now that I think of it I just remembered, 'I was with the score'.

V: And the main reason for this, you were telling me…

S: Because I don't have this emotional attachment to it to make it mine. You play more like with a thinking mind than a feeling mind, feeling body. I didn't know at all what to say with that music. It's like I was discovering it, and I just played to play it. But it wasn't me trying to communicate something. So that is why. Because it's more difficult and I didn't have the cues there to do it after just one year of it.

V: So a couple of more questions. We are almost finishing. What skills do you think a pianist should have to be able to learn and memorise contemporary music, or non-tonal music in this case?

S: A good ear. Not absolute pitch, but a trained ear. Because there are a lot of jumps, usually, dissonant harmonies. Also a good memory of clusters. Maybe you don't know exactly which notes, but you know that there is maybe a cluster on the higher notes and you can find some internal chords you know. So in the end I think, you need a basic knowledge of tonal music, to be able to forget about it and play that. I don't know, because I don't know any case of someone who doesn't know any music who tried to play contemporary music. But I think it would be really difficult, because it's crazy, notes everywhere. Also there are several kinds of contemporary music.

V: Do you think our education background prepares us to have these skills?

S: No [laugh]. Completely not.

V: Why?

S: Because, well this is a sensitive field. I think at least in Spain. I don't know here [in London]. I don't want to generalise, but at least in Spain, when you learn classical music, you focus on auditions. You have to pass some auditions and sometimes it's a really competitive environment. And also the teacher focus on that competitive environment and you are lost in that ego-oriented environment. During that process, you focus on communication aspects, emotional aspects, but they I don't think that at least in Spain they focus on giving you enough skills to be able to communicate with yourself, even when you are not playing Classical music. So for example these improvising assignments, I think that everything should be together, even in the piano

lesson. And it's the same in contemporary music. If they don't do it with improvisation in tonal music, imagine in contemporary. I'm glad I had these assignments [in contemporary music], because before this course in contemporary music I didn't like it at all and it was like 'Oh I [have] contemporary music'. In the beginning I was a little bit sceptical about this assignment. I thought that they had just put it there to make credits. But then the teacher was really good. I enjoyed it and I kind of like it more. Even if I don't keep playing contemporary music. But I enjoyed throughout the year what I have learned. We had it in the last year of the Bachelor, and I thought like 'Oh my god, I hope I have had this subject before in more years', because it's difficult this music.

V: Last question. Have you had any close collaboration with living composers?

S: Yes, I played in Spain. The composer was in the room when I played. It was a prelude from Japan. I played the prelude and then she did like an arrangement of the prelude. But that's the main thing.

V: But did you work with her?

S: Oh, no. Not with any composer.

V: Do you have any other thing you would like to add to the interview?

S: No.

V: Ok, thank you very much and see you in the end of the study, after your perform the piece, for the final interview.

9.4 FINAL INTERVIEW SOPHIA

V: First of all, thank you so much for doing the study. It was great. And congratulations on the performance. Do you have any questions about the study before we start?

S: No.

V: You just finished performing the piece and I want to ask you what were you thinking about and focusing on while performing?

S: I have written this on the score you gave me.

V: Yes, but can you explain the score?

S: I felt I was more perceiving what I was playing, than thinking ahead. Because I didn't practice here [in the performance room], so the sound was new. I tried to focus about the things that I was thinking during practice, so here I thought about the movement of the chords. I always think that I have to maintain the tension here. I thought that I did this F sharp too loud and I kept thinking about that. Also I think the piano is loud. And then I focused here on this rest because I was doing all the time one rest less. So then I realised yesterday and I tried to change that. Here I was thinking mostly about the rhythm and then in this part I tried to think about more in terms of structure, so I thought about three closures. I didn't think about the first one, so that's why I just wrote the second and the third, but I realised like 'Oh, I have to think about it'. So this part, from here to here, I thought about three sections. I thought about three closings. The thing is, I didn't think about the first one. I was trying to think about this, but I forgot, so that's why my thinking was a little bit behind. But then I thought, in these two, 'Okay, that's a closing here'. And then here, I was focusing on the strong chords. So this is for me one little section, and the middle part was just in this bit. And then here, I tried to focus on this voice in the middle, so it gives me the cue to where to put my hands. And also this C augmented chord. It's not automatic, but…Then this section, this middle section, that is more dense, I just did it in one impulse. So I started, and I almost…I thought about, but more than thinking I just felt the movement until here. And then here, I thought about this chord because I always think about it in relation to this one, so the B-flat. And then here, I had a little doubt. But because there is rest there, I had time to think. I was just thinking 'Okay, this was this, this was this'. So I was thinking a little bit like this. And then here I realised I wasn't playing everything really loud. I wasn't doing really much dynamics. Even if I tried a little. So I was thinking this here. And here I thought, it was a little bit automatic. Also the movement of the hand and the right hand position. And [from the end of the first page] this was an impulse. I didn't think much about it, really. And then this, I played too fast. I was thinking I was trying to do this, but I played too fast . I think I did it a little bit slowly, because this is the final part, so here I thought just 'Okay now, relax a little' and finish like calm, automatically.

V: Now, this was about the performance. Lets talk about the practice process. So can you describe for me how did you practice the piece?

S: I remember that in the first rehearsal, the first practice sessions, I was a little bit lost, trying to understand some things. So I was working on little sections. I remember, I got really tired, so I couldn't do more than 40, 45 minutes. I was like 'Okay, my head is not having more notes or weird chords'. So in the beginning I was feeling like this and then, as time progressed, I was starting to be aware of some little sections and I tried to organise in terms of structure. So the middle section was more dense, then I tried to organise in terms of structure, as I saw it. I didn't know if it was the real structure, but it was helping me. And then I was also trying to find some

patterns. For example, in the big sections, I was trying to divide them in little sections of three parts, usually. Maybe some sections have five. But it was useful. So it was three bars usually, but I was thinking, for one impulse, just the whole three bars. Then I started memorising something, and finding some cues, just to remember. And actually the memorisation part, I find it easier, than the understanding part. Because when you understand, you more or less remember, because of how it sounds or just, the movement. My hands were going alone, before than I expected. So I was memorising before I expected. I was like 'Oh, it's going fine'. So The memorisation part was difficult, but not that difficult. The rhythm part was really difficult to memorise.

V: Why?

S: Because there were many silences and I didn't find, or I didn't try to find a pattern of rhythm, so I was just memorising as…Ok, I play several times and I memorise the movement, and the rhythm, but I didn't memorise, consciously like 'Okay I have to count three and four'. I try to practice, counting well, but it was difficult because everything, every rhythm was different and I didn't find any pattern. This rhythm, it appears a lot, I was trying to memorise it just in terms of playing and feeling the rhythm, more than thinking 'okay, so here I have to count, one two, three'. I thought I was playing the rhythm with more feeling than thinking.

V: That's why I wanted to ask you. During the performance, were you doing any counting.

S: Yes, I was counting more in the beginning.

V: Can you show me where? And also where I thought you were counting, just to have an idea?

S: I knew this was one whole bar. And then I count here four, 'One two, three, four' and then 'One, two' .

V: These are semiquavers right? I mean the 'One two, three, four'.

S: Yes, Semiquavers. These first three bars were the ones I counted the most. Because I don't know why I was feeling more uncomfortable in these three bars than on the rest of them. So I was counting these four semiquavers. And here triplets. And then, I don't know why this was confusing me. So here I thought, the four semiquavers and I was paying attention, that these two were in the three and the four. And then I count here four again. And then here I just let it go. I just was singing a bit more. But in the beginning I was thinking 'One two, three, four. One, two.' Also the counting, it was for the character. It gave me, a kind of more, staccato character. And here I just let go.

V: And on the second page as well. You didn't count anything here?

S: I was counting these ones. I was counting 'one, two', then the chords, and 'one, two, three, four'. And the same here. Here I count. I knew this was'one, two, three four, one, two, three four'. I don't know why, but I always got a little bit confused there. So I never knew if I was doing it right or not. I was like, 'okay, yes, I know it's one, two, three four, one, two, three four", but I always took more time here. And here I thought about the triplet.

V: Do you remember more strategies?

S: Singing. I feel that if you can sing it, you can play it, though I was trying to sing just to internalise it. So it was quite useful, because then, maybe I was in my apartment before going to practice and I was thinking, 'what am I going to practice now?'. And I try to sing, and I had something to hold on to. So, if you cannot sing anything, you can memorise it more clearly by movement or by impulse. But the singing, I think is the most useful thing to memorise. So it's the singing.

V: And during performance, were you singing any parts specifically?

S: No, I usually sing, but today not because I realise the rhythm was weaker than the chords, so I was focusing a little more on the rhythm.

V: I noticed in some of the videos that you were calling some parties beauty, beauty and creepy. Do you know where this is?

S: Yes. I think it was somewhere here. I don't know now if it's here or here. Yes, right here. This part was the beautiful part. So at the beginning I was trying out several memorisation techniques. So I was trying to, maybe counting, maybe the movements, and thinking about more beautiful or emotional things that might be helpful. And at the end I didn't use it that much. Today I was thinking, 'I didn't think much about emotional things'. But also this didn't say to me something really emotional. But in this part, this chord was like the beautiful chord. And also this F appears as an F major and this was the only one minor. So I thought about these little things during practice. Also other thing I continued doing was to go up and down with the voices, like the movement of the soprano.

V: These practice strategies that you have been talking about. Could you use them in other pieces as well?

I think yes. The thing is, I don't have a closed number of strategies, I try to experiment. So whenever I find something, I try to use strategies I already know, not

being aware that this is a strategy I know. I'm going to try to focus on voices, now on rhythm, now just on impulses. So the impulses is a technique I use a lot, because with my first teacher, we were using it a lot.

V: What do you mean by impulses?

S: By impulses I mean that you breath, and after breathing you do a whole section, maybe. And then the movement of that section is always the same. So you pass through several steps of several movements. For example, in the coda of the Chopin Ballade, when you don't think about every chord. So when you do the reading you know your hand is going to go 'dah, duh dah, duh, dah, duh' four times or five. And you are not aware of four or five, but you just know it. So it's that sensation of with one reading, you know the whole section, so you don't have to be thinking about every little part when you are playing, or when you are in performance or something. So it helps a lot when you are nervous, or when you have to perform, that you are more aware of things. So you just let go with one impulse or one breath.

V: In terms of memorisation, do you remember in what stage of learning did you start memorising?

S: I think I tried from the beginning, more or less. In the beginning I was like 'Oh I don't know how I'm going to memorise this'. But then I was trying, whenever I felt I could, I tried. I don't remember exactly when I started, but I think I always tried to do it from the beginning.

V: And are there any other memorisation strategies that you remember, to help you memorise?

S: I tried to, because one of my teachers always said to find points. If you're lost, go to that point. I didn't make it really consciously. There were several parts where I knew exactly where to start in the beginning of the sections. I knew if I got lost here, I knew exactly where to start here. So this was one point I knew. Also here was another one. Here too. In different little points inside the big section, in this first part. This first part I didn't know. I knew where to start in the middle sections. So I knew where to start here. I knew where to start here. I knew where to start here [pointing out to different sections and subsections]. It was a difficult one. Also in this second part I tried to, because this was really difficult, to do little sections. So this was one. This was one. This was one. So I worked on starting from memory, in this chord, in this chord, in this chord and in this chord. Also it was difficult because every chord started in a different part of the bar, and with a different rhythm. But then when I played, I though more about the bigger sections, so I didn't think of this one as a point, but this one yes. So this one one point I could start. This one also. And then this was another one because it was easy. Then I realised this was the same as here. And the chords. I

just could remember where I was. Also this starting chord, this is a chord Berio uses a lot, so I just knew it. So these were little points I was really aware of, so if you asked me to start here I think I could. And this one too, this one too and this was easy too [pointing out to the different chords in the score].

V: Very interesting. In terms of memorisation strategies, was it similar to other pieces, the way you worked?

S: Yes. I felt that I was using the same strategies as I used before, and I felt I should be using others because this is different music. But it was my resource, so I just used the ones I knew I was capable of using. I didn't create any new technique.

V: Did you face any specific challenge with this piece?

S: Yes, I felt really tired. This was a challenge for me because I usually study for two hours, sometimes three, but more, in the same piece. And with this one, I couldn't. I was 'okay I'm going to leave it, because I know if I continue, it's not worth it'. But it was a challenge like 'Okay I have to stop'.

V: We are almost finishing. I want to ask you now about the score that you marked just now with the structure of the piece.

S: Sure. So in terms of structure, the first bar, I think at the beginning we have this atmosphere chord. Then from here, I start counting. So this was the first little section [after the atmosphere chord]. Then this was an independent thing, and then the first closing. So this is one section, and the first section was under here. But it has many endings, so the first section could finish here, but then that is a second ending, and then I think it finishes here. So I think here is the first big section. Then here starts the second section. So in this second section, there is this little part. This little part was in between the first and the second. And then here starts the second section with a little section here. And then here starts the main section of the second section, so this is the second [as marked in the score.]. So this was like introduction, main section, closing.

V: Your scores are full of colours, red, blues. Why?

S: The red ones were for the things that I had to remember. This over here was in terms of movement of the hands. Some markings are about notes that I had to pay attention to, others about movement, about chords.

V: One last question. It's about the research study overall. How would you describe your experience of doing this research study?

S: It was really interesting. I realised when you have to record yourself, you don't want to do any more than necessary. So it was really good to realise that I wasn't able to do more than fourty five minutes at most. For example, when I practice classical music, maybe I will stay for two hours, but maybe I don't need two hours. Maybe if I record myself, I will be an hour or less and I would do the same work. So it makes you be more efficient in terms of, I'm going to think about what I want to do. I do that and there is no more. There is no playing just because you wanted. So it was really efficient. It made me think about when I go back to practice some classical music, I have to be aware that I use the time more efficiently.

V: And what about the experience of thinking out loud; thinking about what you were doing?

S: I did that before for myself, so it wasn't weird. I felt it was useful, because it makes you be more aware. Maybe if you don't say it, you start thinking what you want to have for lunch or whatever [laugh]. There was a moment when I started thinking, when I was doing the video, of myself as a teacher; what strategies I used. I stayed in silence for one minute, maybe, because I was thinking of that and then I realised and I explained it in the video. And when you are practising without recording, you just think a lot of things; maybe not related [laugh]. But yes, maybe some things trigger some memories and because I was recording I was blocking those extra thoughts. I was trying to. And when you don't record, you don't block it, you just start thinking about other things.

V: And how did you feel with the camera?

S: It was good. It didn't feel very weird. I felt I was explaining to you. Every time I recorded, I was thinking you were behind me [laugh]. It wasn't weird.

V: Okay, so this is everything for me. Do you have anything you would like to add?

S: I would like to read the study in the end.

V: Yes, of course. You will read. So thank you so much for everything and we will keep in touch.

9.5 FIRST INTERVIEW HARRY

V: First of all thank you very much for doing this study. This study is part of my PhD that is focused on learning and memorisation of non-tonal music. And basically, what you have to do is to learn and memorise Berio's encore number two. First, today, I

would like to do an interview to get to know you better, a little bit of your background. Can you tell me a little bit more about this? About your music studies?

H: I started playing piano very young, about age five or six and only did really casual lessons and just followed the standard route of learning. And then I ended up at Trinity Laban, which was a bit of a second choice to do music in the first place. But when I was studying there for four years, I really started to get into it and now I am very optimistic about the future of music. At Trinity I really developed a love for modern music, twentieth century and contemporary. And now I'm here at the Royal College of Music [doing the contemporary specialism] and I am really enjoying it.

V: And can you tell me a little bit more about the repertoire you have been playing?

H: I am doing a lot of American experimental repertoire at the moment. So pieces by Crumb, Nancarrow, the Concord Sonata, that's the kind of music I really enjoy. But, I love it really, and I do a lot of song accompaniment as well. Which is exactly the opposite, so it's kind of a nice wind down.

V: And did you also play Romantic and Classical pieces? Baroque?

H: Yes, well it was prescribed so I had to. I did enjoy it. I enjoy indulging myself with heavy romanticism, and I am developing a taste for Baroque music now but never been a huge Classical fan; even now or since.

V: Which pieces are you playing right now?

H: So, Ives Concord Sonata, I'm doing Nacarrow's canons, Crumb's *Zeitgeist*, which is a piano duo piece. The big ones I'm doing: Ornstein *Danse Sauvage* and I am hopefully going to learn the fourth sonata next year. In terms of classical music, I am doing a Prelude and Fugue by Bach. Some C.P.E. Bach as well.

V: Do you play your repertoire from memory?

H: Yes, pretty much all the time.

V: All of it?

H: Well, all of it. I don't play accompaniment or duo music. I think every [solo] concert I have done so far has been from memory.

V: And why do you play from memory?

H: Mainly to avoid page turns [laugh]. Lots of the music I play, as you know, there are lots of notes and both hands are being used all the time, so, more for convenience than any kind of "connection". Practicality.

V: So if I ask you about advantages and disadvantages of playing from memory. Can you tell me some?

H: The advantages I was listing, but also it does help for it to flow freely to use a cliché, and it means you're more secure. I find it is more secure even though that most people would saying playing with the score is more secure. It helps to memorise away from the piano and have a picture of the piece almost as opposed to just having two pages and then….well, it's a bit abstract. And the disadvantages, obviously sometimes you muck up [laugh].

V: Now focusing on how you do it, so first I would like to talk about practice and how you practice. So you can think about a specific example of a piece you have been practising recently. What is the first thing you do?

H: So I have zero method. I'll just start at the beginning and play it until it goes. I don't have any techniques, I don't have any specific markings. I'm trying to incorporate a few, but mainly no. I think it's mainly aural and physical memory. I can't explain. It just happens.

V: And if you are near the performance, if you have one week, what do you focus on during that period?

H: Well, I guess that it's the same as always. Again, I have no method. I probably can't elaborate, but more on especially overall picture, if I am a week from a performance and it's technically okay, I won't spend ages refining it. I'll go more holistically, if it's going to be a good performance. I think again that's possibly to do with the repertoire I'm learning. For example Ives, it's less important than saying Chopin and Mozart.

V: But do you use the same approach in Classical and Romantic pieces than in modern music?

H: Yes, I think so. Not consciously. I guess it's just the way it goes. Obviously I would be a bit more careful about notes, but not too much more careful. Hence, I'm not a great Romantic player.

V: And in what stage of learning do you start memorising your pieces?

H: As soon as I can really. But again, I don't sit down with the intention of memorising. I think I have quite a good aural memory, so I find when I've been practising a piece for about half an hour, I think I can do about a minute of what I've been playing from memory, just like that. That's just a guess.

V: And do you use any strategies to memorise your piece?

H: No.

V: Now focusing on the moment of performance. Image you are performing a piece. What do you think about during a performance? What are you focusing on?

H: What comes next. My mind will often wander during performances and I might fixate on an upcoming point and remember that my teacher told me to play this bit that comes in twenty bars. Remember that is a G sharp or something. Probably at the expense of whatever is going on at the moment. Again, I can't point to any method. Usually in performances, my fingers will do it by themselves, so I can just think of little bits.

V: Good. Now moving on to two last topics. One is about skills. So what skills do you think a pianist should have in order to be able to learn and perform modern music, non-tonal?

H: That's a hard one. As opposed to mainstream nineteenth century repertoire?

V: Yes.

H: Conviction. Confidence I guess, and just engagement. I think you just have to like it. I hear so many performances of little compulsory short pieces standard pianists [have been playing] and they don't enjoy it and it's evident. I think a good sense of rhythm is important and being able to do cross rhythms and keep the pulses. But other than that, really, just enjoy it.

V: And one last thing. Do you have any collaborations with living composers?

H: I am actually, at the moment. Not a non-tonal composer. I don't think so. But she is a student here and she is really good. She does a lot of kind of minimalist music.

V: So what kind of collaboration are you doing?

H: We are doing the great exhibition concerts together. She is writing a ballet. I will be on the piano and a dance group that I worked with in my undergrad formed in fact actually. I got some dancers together and they're coming here to perform a piece for

four hands piano and string quartet. It will be about half an hour. A lot of electric music, electroacoustic music. That only started when I came here though. I haven't had any long lasting collaborations.

V: Do you think that contact with the composer will influence the way you prepare the piece?

H: No. As I said, it's a completely different sound world. To be honest I think the style of the piece that I played last term is pretty self-evident. It's pretty well notated. There were some suggestions she had obviously that were helpful. It was very rigidly notated and it wasn't interpative if you know what I mean, so no.

V: Okay, so for me, this is everything. Do you have anything else you'd like to add?

H: No, not particularly.

V: Thank you very much. I will see you after you perform the piece for the final interview.

9.6 FINAL INTERVIEW HARRY

V: Thank you so much for your effort in doing this study and for the performance.

H: I hope this is useful for your research.

V: I just want to ask you now some questions about your process of practice and memorisation of the piece and about the performance. The first question is about the performance. What were you thinking about during performance?

H: You know, I think that was my mistake, in retrospect. I think my mistake was that I didn't think enough, I was focusing really on keeping rhythm and having the notes in the right place, but I didn't mark any kind of points, you know? For example like if I did get lost I would start here for example or this is the place to aim towards. I didn't kind of think in long enough phrases, I guess, if that makes sense.

V: If you go through the piece now, just to look at the score that I just gave you, was there anything you were thinking about in the performance?

H: Things I was thinking about in the performance…

V: Yes, so while you were playing, what was in your head?

H: Don't mess up, don't mess up [laugh]. I guess you could say, the beginning of the third line I was trying very hard not to forget that one, but I did. And also the odd place in which the triplets come, in the rest of the third line. You will see my practice where, in the second page, if I can start in the right place I did have it memorised, but it was just this one line. Well, what I think I would have needed to do is, you know, have more points in which I could restart. So for example, the third bar of the second page, there is a place I can aim towards and restart if I don't get that.

V: But were you thinking about it in the performance?

H: No, but I should have.

V: Also, do you remember having memory slips? And do you remember where they were? And what happened?

H: I think it was the coming into the third line as I said. I remember that I was, I have been practising quite a lot, at the end of the second line where these suddenly few notes, I have been practising going from there, but I think the kind of space that I had [in terms of time space] has just made stop thinking as much.

V: Any other place that you had any other slips?

H: Yes. The fifth to the last bar was also incorrect. And by that point I just kind of resigned myself.

V: So this is about the performance. Now, I am very interested in knowing if by any chance you saw any kind of structure, sections or phrases here and where are they, if you saw and them and thought about them.

H: I tried to do it first in two bars phrases, then in four bars phrases. Well, my aim was to get it probably in eight bar phrases, which I don't think I did have much time to do. But I think that was a bit simplistic, because you know it not always fall meet me into those structures.

V: So, you have here a score to write the structure. If I ask you what is the structure of this piece, what would that be? How do you see the piece?

H: I didn't organise it in terms of dynamics, I wasn't aiming …I didn't see all these lines in terms of aiming towards the two *fortissimos*. That was a bit simplistic, but I guess I was trying to follow some kind of chromatic movements, but I guess that was again another thing I did really is not much search instead of just going four bars. Again, maybe that was because I was too focused in my practice as opposed to…

V: Is this the same for other pieces?

H: I think it was specific to this one. Most of the music that I play isn't like this, it's more kind of involved, if you know what I mean. This is a bit events' based. Most of the music that I play is more kind of narrative, so it's not necessarily, it's a bit more obvious, if you know what I mean.

V: So, usually what do you do in those cases? How do you organise?

H: I guess I don't have a structure because I don't have an organisation only and I think this happens in this piece, because this is, minus the exchanges, just notes, there is not much deviation in say registers. So, you've got really to just know the notes, which is something I don't know very well [laugh].

V: Ok, now about your practice approach. What were the aspects you were mainly focusing on during practice?

H: I think it was keeping a steady rhythm, which applies more to the music that I play.

V: How did you do to make sure you had the right rhythm? What were the strategies you were using?

H: I used metronome to practice a bit at the beginning and feel the beat, but really just keeping internally.

V: Any other aspects that you were focusing on during your practice sessions?

H: Not really. I didn't concentrate much on making a good sound. Again, I think because I was specifically learning this to be memorised, which is not what I usually do. My approach was different and also I was recording myself, aware of everything I do, which is good but inevitably different. I feel like I maybe tried too much to learn the notes and therefore I was too focused on rhythm and perfectionism.

V: Any other strategies that you remember using to learn the piece?

H: No, none particularly stick out. In the beginning I wrote a lot on my score, but that is what I usually do. I found, once I learned the notes that I just thought, 'when am I going to get home', I was just repeating to make it stick, but I didn't.

V: Did you use any form of mental practice?

H: No…

V: So everything you did you recorded right?

H: Yes, I have sent you.

V: Now specifically about memorisation. What were the strategies?

H: Again, very little.

V: Was there a certain point in which you decided that you would memorise?

H: No, in certain practice sessions I set myself some goals. The first two lines, the last two lines. For example, and in the first sessions, I achieved it, but I needed to get the middle two lines to stick as well, but…yeah…I did set myself some memory goals. but I didn't have any kind of ground search, which is what I needed to. I think I thought it's just a minute long piece, is not going to need analysing.

V: Is it trickier than it seems?

H: Yes.

V: *So the approach that you are telling me of practising and memorising, is this the approach that you usually use when you memorise other pieces?*

H: Yes, it is. But again, the music that I play is usually easier, because I can listen to myself playing. I know where it is going and I can hear it in my head, as opposed to this, which is not meant to be. Well, I don't think it is meant to be memorable, it's more like that it sticks.

V: Yes, now we are almost finishing, just particularly about the piece. What were the main challenges you faced when learning and memorising it?

H: I mean, the first bar of the last line is hard, but other than that it's pretty easy. I learned through it pretty quickly, with the score, fewest readings and corrections throughout, but if I was going to play it more times, I would have obviously do a lot more practising of course.

V: And what were the main challenges in terms of memory? Did you feel any particular challenges while you were memorising?

H: Yes, the last line of the first page, and the first line of the second page. Those two lines were the challenge for me.

V: Why do you think they were challenging?

H: I think because there is more space. I mean, those two lines, on the last two bars of the second line of the first page, you will see in the recordings that from there is when I kind of started … I needed to work more. Also, I think the beginning is easier because it's where you automatically start from and than the end has a bit of a tune, which is easier to memorise.

V: Last question, about the study in general. How did you feel about doing this study and how was your experience of recording yourself?

H: I felt that I didn't have enough time to do it. You know, I have a lot of work this week and it felt like a bit of a trouble. So I think that maybe for that reason my practice wasn't as good as it usually is. But I mean, I look forward to see the results.

V: What about the experience of recording yourself? You were talking about that, of being recorded. Did that affect your practice?

H: I think that in the beginning it did. I felt that I was performing much more. I got less and less worried about the camera, but again, it does feel a bit like performing when practising and I feel that I usually take more breaks during practice just to like slip out of the piano for like 2 min or so, but I didn't do those, because that's not something you want to see. Sometimes those little breaks might help, that's just speculation. I hope that this is useful for your research.

V: Yes, of course! Thank you so much for your effort and for accepting to do this study. We will keep in touch.

APPENDIX 10. ETHICAL APPROVAL

10.1 ETHICAL APPROVAL STUDY 1

Conservatoires UK (CUK) Ethical Approval Form
for staff and student research involving the participation of other people

Type of project:	POSTGRADUATE
Title of project:	Entering the Composer's Mind: The understanding of the creative process as a fundamental tool toward the memorization of contemporary piano music
Name of researcher(s):	Vera Fonte
Name of supervisors(s):	Tânia Lisboa
Date: 1/12/2014	

	Mark with ✓ in box	YES	NO	N/A
1	Will you describe the main experimental procedures to participants in advance, so that they are informed about what to expect?			✓
2	Will you tell your participants that their participation is voluntary?	✓		
3	Will you obtain written consent for participation?	✓		
4	If the research is observational, will you ask participants for their consent to being observed?			✓
5	Will you tell participants that they may withdraw from the research at any time and for any reason?	✓		
6	With questionnaires, will you give participants the option of omitting questions they do not want to answer?			✓
7	Will you tell participants that their data will be treated with full confidentiality and that, if published, it will not be identifiable as theirs?	✓		
8	Will you debrief participants at the end of their participation (i.e. give them a brief explanation of the study)?	✓		
9	With interviews, will you tell your participants that you wish to record the interview, and that they may decline to have their interview recorded?	✓		
10	With research that requires audio or video recordings, will you tell your participants that their permission will be sought to play any excerpts in the course of presentations given?	✓		

If you have marked **No** to any of Q1-10, but have **marked Box A** overleaf, please give an explanation on a separate sheet. (*Note:* N/A = not applicable).

	Mark with ✓ in box	YES	NO	N/A
11	Will your project involve deliberately misleading participants in any way?		✓	
12	Is there any realistic risk of any participants experiencing either physical or psychological distress or discomfort? If **Yes**, give details on a separate sheet and state what you will tell them to do if they should experience any problems (e.g. who they can contact for help).		✓	

If you have marked **Yes** to Q11 or 12 you should normally **mark Box B** overleaf; if not, please give a full explanation on a separate sheet.

	Mark with ✓ in box		YES	NO	N/A
13	Does your project involve work with animals? If yes, please **mark Box B** overleaf.			✓	
14	Do participants fall into any of the following special groups? If so, please refer to BPS or BERA guidelines, and **mark Box B** overleaf. **You should ensure that you have DBS clearance.**	School children (under 18 years of age)		✓	
		People with learning or communication difficulties		✓	
		Patients		✓	
		People in custody		✓	
		People engaged in illegal activities (e.g. drug-taking)		✓	

PLEASE MARK **EITHER** BOX A OR BOX B BELOW AND **PROVIDE THE DETAILS REQUIRED** IN SUPPORT OF YOUR APPLICATION. THEN PRINT AND SIGN THE FORM.

Mark with ✓

A. I consider that this project has **no** significant ethical implications to be brought before the CUK Research Ethics Committee.	✓

Give a brief description of participants and procedure (methods, tests used etc.) *(max. 150 words)*.

This project will include a set of semi -structured interviews with key informants, namely pianists and composers. It will be tell to the participants that their data will be treated with full confidentiality, unless they give consent to disclose their names. The main aim of the interviews is to collect data about the way pianists perform and memorize their repertoire, focusing particularly in the case of contemporary piano music. Other questions addressed will be why pianists memorize or don't memorize contemporary music; advantages or disadvantages of memorizing contemporary music; among others. The interviews will be piloted with piano students from Royal College of Music, namely students from the project "Contemporary music and action" and students from the Master in Contemporary Music.

OR

Mark with ✓

B. I consider that this project **may** have ethical implications that should be brought before the CUK Research Ethics Committee, and/or it will be carried out with children, vulnerable young people or vulnerable adults.	

Please provide all the further information listed below in a separate attachment.

1. Title of project
2. Purpose of project and its academic rationale
3. Brief description of methods and measurements
4. Participants: recruitment methods, number, age, sex, exclusion/inclusion criteria
5. How you will obtain informed consent and provide debriefing
6. A clear and concise statement of the ethical considerations raised by the project and how you intend to deal with them
7. Estimated start date and duration of project

Please discuss with the CUK REC representative at your institution (normally Dean of Research or equivalent) which guidelines are more appropriate for your research and then tick the box to indicate those you have read (✓):

I have read and am familiar with *either* the BPS Code of Human Research Ethics (http://www.bps.org.uk/sites/default/files/documents/code_of_human_research_ethics.pdf) ✓

or the BERA Ethical Guidelines (http://www.bera.ac.uk/wp-content/uploads/2014/02/BERA-Ethical-Guidelines-2011.pdf) ✓

and (if appropriate) I have discussed them with the other researchers involved in the project. ✓

Signed: [redacted]..... **Print name:** Vera Fonte **Date:** 1st December, 2014
(UG or PG researcher, if applicable)

Signed: [redacted] **Print name:** Tânia Lisboa **Date:** 1st December, 2014
(Lead Researcher or Supervisor, if applicable)

Signed: … [redacted]… **Print name:** Aaron Williamon **Date:** 1st December 2014
(CUK REC representative at your institution)

10.2 ETHICAL APPROVAL STUDY 3

Conservatoires UK (CUK) Ethical Approval Form
for staff and student research involving the participation of other people

Type of project:	POSTGRADUATE
Title of project:	Pianists learning and memorising a non-tonal piano piece: an observational study
Name of researcher(s):	Vera Fonte
Name of supervisors(s):	Tania Lisboa
Date:	8/12/2017

	Mark with ✓ in box	YES	NO	N/A
1	Will you describe the main experimental procedures to participants in advance, so that they are informed about what to expect?	✓		
2	Will you tell your participants that their participation is voluntary?	✓		
3	Will you obtain written consent for participation?	✓		
4	If the research is observational, will you ask participants for their consent to being observed?	✓		
5	Will you tell participants that they may withdraw from the research at any time and for any reason?	✓		
6	With questionnaires, will you give participants the option of omitting questions they do not want to answer?			✓
7	Will you tell participants that their data will be treated with full confidentiality and that, if published, it will not be identifiable as theirs?	✓		
8	Will you debrief participants at the end of their participation (i.e. give them a brief explanation of the study)?	✓		
9	With interviews, will you tell your participants that you wish to record the interview, and that they may decline to have their interview recorded?	✓		
10	With research that requires audio or video recordings, will you tell your participants that their permission will be sought to play any excerpts in the course of presentations given?	✓		

If you have marked **No** to any of Q1-10, but have **marked Box A** overleaf, please give an explanation on a separate sheet. (*Note:* N/A = not applicable).

	Mark with ✓ in box	YES	NO	N/A
11	Will your project involve deliberately misleading participants in any way?		✓	
12	Is there any realistic risk of any participants experiencing either physical or psychological distress or discomfort? If **Yes**, give details on a separate sheet and state what you will tell them to do if they should experience any problems (e.g. who they can contact for help).		✓	

If you have marked **Yes** to Q11 or 12 you should normally **mark Box B** overleaf; if not, please give a full explanation on a separate sheet.

	Mark with ✓ in box		YES	NO	N/A
13	Does your project involve work with animals? If yes, please **mark Box B** overleaf.			✓	
14	Do participants fall into any of the following special groups? If so, please refer to BPS or BERA guidelines, and **mark Box B** overleaf. **You should ensure that you have DBS clearance.**	School children (under 18 years of age)		✓	
		People with learning or communication difficulties		✓	
		Patients		✓	
		People in custody		✓	
		People engaged in illegal activities (e.g. drug-taking)		✓	

There is an obligation on the lead researcher to bring to the attention of the CUK Research Ethics Committee any issues with ethical implications not clearly covered by the above checklist.

PLEASE MARK **EITHER** BOX A OR BOX B BELOW AND **PROVIDE THE DETAILS REQUIRED** IN SUPPORT OF YOUR APPLICATION. THEN PRINT AND SIGN THE FORM.

Mark with ✓

A. I consider that this project has **no** significant ethical implications to be brought before the CUK Research Ethics Committee.	✓

Give a brief description of participants and procedure (methods, tests used etc.) *(max. 150 words)*.

The purpose of this study is to examine strategies used by postgraduate students/professional musicians to learn and memorise a non-tonal piano piece. Postgraduate students/professional musicians will be recruited and asked to learn and to memorise Luciano Berio's *Encore No. 2*. Once they accept to participate in the study, they will be interviewed about their background and approaches to practice and memorisation. The participants will be asked to video-record all practice sessions and, when possible, comment to the video camera on what they are doing, namely the musical and technical decisions made, as well as practice and memorisation strategies used. They will also receive different copies of the score throughout the learning process and will be asked to write down their musical and technical decisions. The number and duration of practice sessions won't be limited, but a date for the performance will be set in the beginning of the learning process (around a month and a half after the pianists start learning the piece). The performance will be video-recorded and followed by an interview focused on their experiences of learning, memorising and performing the piece. The pianists will be also asked to write down on a score what they were thinking and focusing on during performance. Recall tests will be also conducted after the performance, namely a written recall test (asking the participants to write down how much they remember) and a recall test examining the participants responses to visual and auditory excerpts extracted from the piece and their performance cues.

OR

Mark with ✓

B. I consider that this project **may** have ethical implications that should be brought before the CUK Research Ethics Committee, and/or it will be carried out with children, vulnerable young people or vulnerable adults.	

Please provide all the further information listed below in a separate attachment.

1. Title of project
2. Purpose of project and its academic rationale
3. Brief description of methods and measurements
4. Participants: recruitment methods, number, age, sex, exclusion/inclusion criteria
5. How you will obtain informed consent and provide debriefing
6. A clear and concise statement of the ethical considerations raised by the project and how you intend to deal with them
7. Estimated start date and duration of project

Please discuss with the CUK REC representative at your institution (normally Dean of Research or equivalent) which guidelines are more appropriate for your research and then tick the box to indicate those you have read (✓):

I have read and am familiar with *either* the BPS Code of Human Research Ethics (http://www.bps.org.uk/sites/default/files/documents/code_of_human_research_ethics.pdf) ✓

or the BERA Ethical Guidelines (http://www.bera.ac.uk/wp-content/uploads/2014/02/BERA-Ethical-Guidelines-2011.pdf) ✓

and (if appropriate) I have discussed them with the other researchers involved in the project. ✓

Signed: [redacted] **Print name:** Vera Maria Seco Afonso Fonte **Date:** …8th January 2018
(UG or PG researcher, if applicable)

Signed: [redacted] ..... **Print name:** ……Tania Lisboa ……. **Date:** …8th January 2018
(Lead Researcher or Supervisor, if applicable)

Signed: … [redacted] **Print name:** Neta Spiro …… **Date:** 4th February 2018 ……
(CUK REC representative at your institution)

E-mail address of CUK REC representative at your institution: neta.spiro@rcm.ac.uk ……

Please turn to next page.