ROYAL

COLLEGE

OF MUSIC

London

PREPARING TO PERFORM:
PROFESSIONAL MUSICIANS' PRE-PERFORMANCE ROUTINES AND STRATEGIES

Berenice Beverley Zammit

Thesis submitted for the degree
of Doctor of Philosophy at the
Royal College of Music, London
September 2023

DECLARATION

I hereby confirm that the entire submission is my own work and has not been submitted for a comparable academic award.

ABSTRACT

Studies in sport psychology have extensively shown that pre-performance routines (PPRs) - a sequence of cognitive and behavioural actions used prior to performance - optimize performance under pressure. Despite this positive impact, there is hardly any literature on PPRs in the music domain. Therefore, this thesis aimed at filling this gap in the literature.

This thesis consists of 3 studies. The aims of Study 1 were to investigate pre-performance routines in professional musicians and to explore whether these change prior to performance. It also aimed to investigate the reasons behind musicians' engagement in these routines. Study 2, informed by results from Study 1, aimed to investigate pre-performance routines in professional musicians in greater depth and to explore the functions these were perceived as having. Study 3, built on results from Study 2, aimed to investigate physical activity and exercise (PA/PE) in professional musicians. It also sought to explore the type of PA/PE engaged in and the reasons for this engagement. Finally, Study 3 aimed to investigate what functions PA/PE was perceived as having on professional musicians' wellbeing and performance.

Study 1 involved the online survey *Pre-performance Routines* survey which was distributed to international professional musicians. Data were collected from 94 musicians and analysed using the statistical package Jamovi version 1.2.27.0. Study 2 concerned an interview study with 12 orchestral musicians recruited from professional orchestras. Study 3 involved the *Fit Musician* online survey which was distributed to professional musicians. Data were collected from 144 musicians and analysed using the statistical package Jamovi version 2.3.21.0.

Results from Study 1 showed that professional orchestral musicians engaged in several pre-performance routines prior to performance but that most routines were reported as not changing during their pre-performance period. PA/PE was among these routines. Study 2 showed that PA/PE was part of the daily/weekly routine of professional musicians and that some engaged in it with a view of enhancing performance. Study 3 showed that 83% of professional musicians exceeded the recommended weekly requirements for PA/PE and that type of exercise engaged in depended on performance scenario. Study 3 showed no association between musicians' perception of physical fitness and health and wellbeing, and

no significant difference between musicians' perception of physical fitness and the perceived impact of PA/PE on performance.

In providing a picture of how professional musicians prepare to perform, this thesis has provided useful information on practice routines and strategies that can be adopted by students. The findings of this thesis also provide the necessary groundwork for future research investing in exploring PA/PE and music performance.

ACKNOWLEDGEMENTS

This list of acknowledgments can never be exhaustive but first and foremost I would like to thank my supervisors Aaron Williamon and Terry Clark for sharing their expertise and for being a source of inspiration for years to come.

Forever grateful to the wonderful team at the Centre for Performance Science for having been part of my extended family over the years and for having shaped me so profoundly in who I am today. I am also grateful to the Malta Government Scholarship Scheme for having funded part of my Doctoral studies.

I am indebted to all the musicians who took part in my studies, especially to those with whom I shared the hardships and uncertainty of those early days back in March 2020. But also thankful to COVID-19 for having shaped this current thesis and my career more generally, rendering me more resilient in the face of adversity.

Thanks goes to my extended family and friends who have supported me along this journey each in their own way. To Franci, for her precious time, her perseverance and long hours. To Toni, whose guidance, kindness and patience supported me through my studies.

To my dear aunty Censina – and all my dear ones whom I have loved and lost – who passed away days before I could share with her the joy of having submitted. And to my amazing parents and sister, for having been my strength in difficult times.

And to Ary and Merry, whose countless antics and timely pawing in moments of discomfort brought me solace. And to my partner, whose singing practice accompanied my writing, and for always being constant, always present - thank you for being you.

TABLE OF CONTENTS

LIST OF FIGURES AND TABLES

INTRODUCTION

> *I have three little steps for all students because when I played the first time Strauss oboe concerto in the class in Hannover, I was so shaking that I could not get the reed in my mouth […] I was really so shaking and I had to stop after the exposition […] because I was shaking with my whole body and I thought something went wrong […] I think my very wise colleagues mentioned already some approaches, one is surely play it as often as you can […] and always set yourself under a kind of concert stress […] [A]nd then the next thing which helps me is rituals […] My ritual: eat, if I have a concert in the evening, I eat pasta for lunch, then I go to sleep for 2 hours, then I go to the concert, I eat maybe a banana or 2 bananas, drink some herbal tea and then I go on stage. […] [F]or everybody it's different but there is some certain steps which you can do, and these are just a must […] [L]ike Stefan for instance, he told me, he is a great sportsman, and he drives, drove for 30 years with his bicycle to the Philharmonic and he said "when I played the […] Weber concerto […] I was playing while I drove to the Philharmonic hall, in my head, I was playing the Weber concerto. Every day. I played it in my head for I don't know, 2 weeks, 3 weeks, 4 weeks, and then I went on stage and I thought ok, I just imagine myself being on the bike" […] [I]t's really rituals which can help a lot.* (Albrecht Mayer, Carnegie Hall, n.d., 0:12).

The above quote is taken from the Berlin Philharmonic Master Class presented on the Carnegie Hall YouTube channel involving four musicians from the Berlin Philharmonic. These were flutist Andreas Blau, oboist Albrecht Mayer, clarinetist Wenzel Fuchs and bassoonist Stefan Schweigert. The panel addressed preparation strategies for performance, in particular, for audition, and stressed the importance of being musically prepared prior to performance. The panel suggested performing the repertoire to family and friends prior to the day of performance. They also recommended adopting "rituals" which, Meyer stated, need not be the same for every performer but which each individual "must" have, as they "can help a lot" in giving a good performance.

According to the literature, performers take in cues from the surrounding environment and from their own movements to help with their performance (Kenny, 2011). Preparing all aspects of performance, as suggested by the panel of musicians above, is helpful as performers have a finite capacity to attend to all the relevant cues in the performance setting (Kenny, 2011). During performance, as arousal or cognitive or somatic anxiety increases, the range of cues to which a performer can attend to is reduced (Easterbrook, 1959). This can result in a deterioration of the quality of performance also known as perceptual narrowing (Kahneman, 1973). As Kenny (2011) states, high cognitive anxiety can result in a preoccupation with extraneous stimuli, such as focusing on the audience's reactions, which is irrelevant to the performance and which interferes with the attention needed to meet the challenges of performance. Therefore, performance preparation, such as visiting the concert venue and practising in the performance setting, may be helpful in reducing the demands on attention on performance day.

Effective performance under pressure is generally characterized by the consistent execution of complex motor skills in a near perfect or flawless manner (Singer, 2002). Such performances are also characterized by an optimal mindset where the performer manages to focus on the task at hand despite other competing stimuli (Kao et al., 2013). One factor that has been consistently regarded as determining the probability of effective performance is the way an individual prepares for performance. One approach that has been reported as positively impacting upon performance is the use of preparation / pre-performance routines (Cotterill, 2011), or, as the oboist Albercht Mayer stated, "rituals".

Most of the available studies on pre-performance routines are from the field of sports. The popularity of these routines stems from the belief that performers can concentrate more effectively after they have engaged in these routines (Cotterill, 2010). Therefore, it may be helpful to direct attention to the type and relative usefulness of pre-performance routines in musicians. In a study by Cotterill et al. (2010), for example, pre-performance routines were found to aid stressful competitive performance by allowing individuals to decide how to allocate attention prior to performance by choosing the psychological skill they preferred to support their performance. The nature of the developed and practiced pre-performance routines varied according to personal and situational factors. This is in line with what Mayer states when he says that "rituals […] [F]or everybody it's different".

The advice that Mayer gives to students at the Berlin Philharmonic Master Class is to adopt pre-performance routines as one of three steps in dealing with music performance anxiety (MPA). He draws on his own experience of when he first played the Strauss concerto where he needed to stop playing after the exposition due to trembling. The experience of anxiety is no stranger to the majority of people who perform in front of others. For many, the stage is a threatening and frightening place to be and it is made even more difficult by the experience of unwanted emotions, thoughts and behaviours (Kenny, 2011).

A number of studies examining professional and higher education student musicians have shown that MPA can negatively affect the quality of performance (Fishbein et al., 1988; Wesner et al., 1990). Performance anxiety manifests itself in three general types of interrelated symptoms: physiological, behavioural and cognitive. Physiological symptoms are natural, sympathetic responses of the autonomic nervous system which include increased heart rate and palpitations, hyperventilation, sweating, dry mouth, nausea, diarrhea and dizziness (Williamon, 2004). Valentine (2002) describes these symptoms as part of the fight-flight response of our ancestors in a potentially dangerous or life-threatening situation. She states that this fight-flight response is highly detrimental to musicians who require dexterity and fine muscular control over their instrument. She also states that increased arousal generally leads to a narrowing of the focus of attention, negatively effecting performance. Behavioural symptoms include shaking, trembling, fidgeting, stiffness and a dead-pan expression. These symptoms can either impair performance through trembling or they might convey to the audience the idea that the performer is scared, potentially undermining the effort of the performer to communicate effectively with the audience. The cognitive symptoms consist of subjective feelings of anxiety and negative thoughts about performing. As Williamon (2004) states, such worry can lead to poor concentration and may act as a cue to enhance anxiety.

The last two decades have seen a flourish in research on MPA, namely because of the high incidence of maladaptive pre-performance anxiety in musicians and because there is a recognition of the debilitating effects that anxiety can have, not only on performance, but also on the overall well-being of the performer (Steptoe, 2001). Research to date has focused mainly on the diagnosis, assessment and treatment of MPA. The outcomes of research have facilitated the development within clinical settings of a range of suggested coping strategies such as cognitive behavioural therapy, hypnotherapy, meditation, positive self-talk, biofeedback and Alexander Technique (Papageorgi et al., 2007).

The size of the problem of MPA, however, is illustrated in Patston and Loughlan's (2014) study showing that despite the current coping strategies, there is a high level of beta-blocker usage in professional musicians. Such usage comes with a high level of risk especially if taken without a medical prescription. Moreover, a study by Nube (1991) found that beta-blocker medication can effectively block the physical symptoms associated with anxiety, such as palpitations and tremors, but can negatively affect cognitive, perceptual and psychomotor skills.

In contrast to the vast array of mental strategies used to help enhance performance, there is little research on how physical strategies, such as physical activity and exercise, can impact performance. There is also very little research concerning physical activity and exercise in musicians. Specifically, there is no research investigating physical activity and exercise in professional musicians and no research exploring the perceived impact physical activity and exercise have on music performance. This thesis therefore fills this gap in the literature.

The global COVID-19 pandemic hit the UK in March 2020 imposing a series of restrictions and lockdowns. The first restriction pre-lockdown came on the 16th of March 2020 requiring the avoidance of all non-essential contact and travel. The first lockdown was announced on the 23rd of March 2020 and lockdown measures came legally into force on the 26th of March 2020. Study 2 of this thesis occurred during this time frame. All interviews took place between the 17th of March and the 30th of June 2020. This means that all planned in-person interviews had to be suspended and replaced by online ones. It also meant that almost all interviews had to be postponed till participants travelled back to their home country and could then take the interview online. Interviews were then conducted across different time zones, and many occurred when participants were self-isolating.

It is important to keep in mind that during this time, and therefore, during all interviews, all performances were cancelled, and participants were no longer performing for live audiences. It is also worth mentioning that the inevitable surge in the use of digital technologies during the COVID-19 pandemic forced the population to adjust to a new way of life. During the course of these interviews, therefore, participants were dealing with this readjustment and with the uncertainty of whether and when they would resume performing.

Between the launch of Study 2 on the 17th of March 2020 and the launch of Study 3 occurring on the 17th of May 2021, the UK had already gone through three national lockdowns. This exceptional period of time steeped in uncertainty and heavily marked by social distancing norms required that the original tentative mapping for Study 3 be reviewed and reworked in such a way for data to be collected without the need to rely on in-person interaction. It was therefore necessary to abandon previous plans of an intervention study needing in-person interaction for biomarker feedback on performers, physical exercise and performance, and to reroute to the present Study 3 comprising of an online survey entitled *Fit Musician*. Besides the documented online fatigue (Bullock et al., 2022; Gregersen et al., 2023) that ensued from increased digitization during COVID-19, the rise in survey distribution during this time led to survey fatigue which, according to De Koning et al. (2021), resulted in reduced response rates and data collection quality. To recruit as many participants as possible, the *Fit Musician* survey was left open till the 5th of June 2022. The data collected for *Fit Musician*, its results and analysis must therefore be viewed within this context.

CHAPTER 1

Literature Review

1.1 INTRODUCTION

This chapter is divided into four main sections: Pre-Performance Routines, Maladaptive and Facilitative Music Performance Anxiety, Physical Activity and Exercise, and Rationale for Present Research, and Outline of the Present Thesis. Pre-Performance Routines (Section 1.2) concerns the literature which investigates pre-performance routines in sport, across performance domains and in music. Section 1.3 (Maladaptive and Facilitative Music Performance) deals with music performance anxiety and explores literature which focuses on routines and strategies designed to help cope with it. Section 1.4 (Physical Activity and Exercise) discusses the impact of PA/PE on general health and on music performance. Section 1.5 (Rationale for Present Research) provides the rationale for research and presents the research questions that emerge from the literature. Finally section 1.6 (Outline of the Present Thesis) provides a brief description of the thesis.

1.2 PRE-PERFORMANCE ROUTINES (PPRs)

Cotterill (2011) states that one factor that has been consistently highlighted as determining the likelihood of effective performance under pressure, is the way the performer prepares for performance. One particular approach that has had an extensive positive impact upon performance is the use of pre-performance routines (PPRs). There are a number of definitions in the literature that attempt to clarify the meaning of PPRs. Crampton (1989), for example, refers to PPRs as an ordered collection of thoughts and behaviours. Cohn (1990) refers to PPRs as sequences of motor, emotional and cognitive behaviours performed immediately prior to the execution of a self-paced task. Foster et al. (2006) suggest that PPRs involve cognitive and behavioural elements that regulate arousal and concentration intentionally. Moran (1996) defines PPRs as “a sequence of task-related thoughts and actions which an athlete engages in systematically prior to his or her performance of a specific sports skill” (p.177). This definition highlights the importance of both cognitive processes and behaviours in preparation to giving a successful performance. As Cotterill (2011) states, this definition is the one that has been adopted the most readily by studies exploring PPRs. This definition will therefore also be the one used in this thesis to indicate the cognitive processes and the behaviours that musicians adopt in the period of time in which they start readying for performance.

The existing literature dealing with PPRs is heavily focused on sport and advocates a number of ways in which these routines can aid performance (Cotterill, 2015). For this reason, this section will first deal with PPRs in sports and then it will discuss PPRs in other domains such as the performing arts.

1.2.1 Pre-performance routines in sport

It is important to clarify that in sport PPRs have been referred to either as "pre-performance routines" by authors such as Moran (1996), Singer (2002) and Cotterill (2010), or "pre-shot routines" by authors such as Cohn et al. (1990), Mack (2001) and Shaw (2002). As Cotterill (2010) states, all references to pre-shot routines occur in studies where performance is described in terms of shots. In such cases, pre-shot routines can be classified as a description of an activity of a pre-performance routine. The literature also makes reference to PPRs as mental preparation routines which have been defined as systematic, ritualized patterns of pre-planned sequences of thoughts, physical actions and arousal-related cues (Gould & Udry, 1994). This definition refers to the same phenomenon described in Moran's (1996) definition of PPRs.

The area which has received the greatest attention in the literature dealing with PPRs is the link with performance (Cotterill, 2010). The most popular approach is that of testing a control group's performance against that of an experimental group which has been taught and has practiced a PPR (Jackson & Baker, 2001; Lautenbach et al., 2015; Wergin et al., 2020). This approach has been carried out across a range of sports with reports of enhanced performance after engagement in PPRs. Hall and Erffemeyer's (1983) study, for example, reported how highly skilled female basketball players improved free throw accuracy after visuomotor behaviour rehearsal. In golf, Douglas and Fox's (2002) study showed that better performers had more consistent routines in their behavioural composition and temporal duration.

However, while the link between PPRs and performance has been reported widely, it is less clear what functions PPRs fulfill in enhancing performance (Cotterill, 2010). The popularity of PPRs in sport stems mostly from the belief that they enable performers to concentrate more effectively. Boutcher and Crews (1987) suggest that PPRs reduce the impact of distractions and act as a trigger for well-learnt movement patterns, while Boutcher (1992) suggests that PPRs prescribe attentional focus. PPRs are also thought to: divert attention from task-irrelevant thoughts to task-relevant ones; improve concentration; help performers achieve behavioural and temporal consistency in their performance; enhance the recall of physiological and psychological states; prevent performers from focusing on the mechanics of their skills and the resulting unravelling of automaticity; allow performers to evaluate conditions and calibrate their responses (Cotterill, 2010).

Singer (2002) also suggests that the purpose of PPRs is to put oneself in an optimal emotional, confident, high self-expectant, focused state immediately before performance and to remain in that state during performance. Shaw (2002) also hypothesized that the value of PPRs may result in the pre-sensitization of the movement system to the appropriate perception-action coupling between the environment and the performer. However, as Cotterill (2010) suggests, these functions have not been the focus of investigation but have only emerged as a result of other analyses. Hazell et al. (2014) add that the functions presented in these studies do not take into account other performance-related psychological variables such as self-efficacy, motivation and anxiety. There is therefore not enough depth of research which explores and tests the functions that PPRs fulfill (Cotterill, 2010; Hazell et al., 2014).

Cotterill (2010) states that the above-mentioned studies by Boutcher and Crews (1987), Boutcher (1992), Singer (2002) and Shaw (2002), among others, put forward suggestions made in prior related publications which never explicitly explored PPRs. Of the studies that have explored PPRs, Mesagno et al. (2008) state that most have not explored the mechanism through which routine use and performance occurs. Hazell et al. (2014) add that many research designs have either focused on the relationship between the presentation of a routine and performance or have utilized non-representative participant samples. Other designs, however, have used non-realistic time frames in which participants could learn their new PPRs. One example of this is Mesagno and Mullane-Grant’s (2010) study on players of Australian football, testing which aspect of PPRs was the most beneficial to performance. Results to this study showed that performance improved, despite the increase of state anxiety in players during the high-pressure phase. This was so especially after a non-automated PPR consisting of psychological and behavioural components as opposed to a PPR consisting of either one or the other components. However, participants in this study were only allowed 20 minutes in which to learn their PPRs whereas evidence in the literature exists suggesting that it can take days, weeks or even months to embed the required habits that will underpin the execution of PPRs in a performance setting (Cotterill, 2011; Hill et al., 2011). Empirical evidence regarding the effectiveness and the manner in which PPRs influence the performer and performance has therefore not been universally understood and acknowledged (Cotterill, 2011).

Early research exploring PPRs focused mostly on behaviours and timing of PPRs (Cotterill, 2010). These studies centered on comparing successful with unsuccessful performance, or with comparing novice with elite performers as a way to ascertain whether differences existed. However, while these descriptions provided an understanding of the behavioural components of routines used and the overall duration of PPRs, or the duration of discrete behavioural components, the differences were not explained. Results in these studies, for example, point to expert performers as having more consistent routines than novice performers, however, no explanation is given as to whether consistent PPRs contribute to the higher level of performance and consistency in elite performers.

Among the few studies that have empirically explored the impact of PPRs on psychological constructs are Jackson et al.'s (2001) study of an elite rugby kicker, and Cotterill et al.'s (2010) study of elite golfers. In the first study, the athlete made use of a range of psychological strategies including specific mental cues, inverse simulation, thought stopping, visualization and relaxation techniques. These, however, differed between attempts. In fact, this study concluded that it was more important to have a successful application of specific psychological strategies when kicking than of having a temporal consistency of the PPRs. Cotterill et al.'s (2010) study concluded that the development of PPRs, particularly of psychological skills employed within the routines, was dependent on one's personality, coping resources, and situational appraisals of each individual performer. This study also reported that the routines utilized by the golfers enabled them to achieve an enhanced self-efficacy state prior to skill execution.

Hill et al.'s (2010) study on choking in elite golf reported that PPRs generated feelings of increased self-efficacy in participants under conditions of high pressure. This supports Singer's (2002) suggestion of a link between PPRs and self-efficacy as routines might enable athletes to better control their anxiety levels prior to performance. However, as Hazell et al. (2014) point out, these hypothesized links between PPRs, reduced anxiety and increased levels of self-efficacy, have not been empirically tested. In fact, both Cotterill et al.'s (2010) study and that of Hill et al.'s (2010) collected retrospective athlete reflections instead of testing pre- and post-performance.

Research in self-efficacy in sport has been underpinned by Bandura's self-efficacy theory which highlights the importance of specifically considering confidence in relation to the task (self-efficacy) about to be executed (Hazell et al., 2014). It is important, therefore, that in research concerning self-efficacy, this is investigated prior to performance, not after, as knowledge of results and performance can have an impact on the reporting of a performer's self-efficacy levels (Hazell et al., 2014). Hanton et al. (2008) further report that self-efficacy can impact athletes' interpretations of anxiety prior to performance. Therefore, if a PPR is found as having a positive impact on self-efficacy, there could also be an associated reduction in both somatic and cognitive anxiety. In this case, such perceptions may become associated with more positive interpretations prior to performance.

1.2.2 Developing, Measuring and Quantifying PPRs in Sport

A number of approaches have been suggested in attempting to achieve consistent and highly effective performance. Singer (1988) introduced the 5-step approach consisting in readying, imaging, focusing attention, executing and evaluating. Murphy (1994) suggested the 'performance management model' to create a sense of flow, consisting of practice, preparation, performance and analysis. Cotterill (2010) contributed to this by suggesting using the first four steps of Singer's (1988) approach as a global template to be used in golf routines as it would allow for flexibility in modifying the routine according to behaviours and timing while still fulfilling the requirements of the individual golfer.

A good portion of research exploring PPRs in sport has focused on the behavioural and temporal characteristics of the routines. As a result, recommendations have focused on developing consistency in both (Cotterill, 2010). Jackson and Baker (2001) suggest that although consistency in the sequence of behaviours is important, other factors, such as task difficulty, influence the duration of a routine. Holder (2003) states that the most important feature of the application of PPRs is their individualization, highlighting that what performers do is more crucial than how long it takes them to do the routine. In agreement with Holder, Cotterill (2008) states that each routine should be modelled around the needs of the individual performer and that it is essential to have a generic template for the routine based upon the psychological demands. Although this suggestion was made specifically for golfers, the solution offers the opportunity to develop a routine which could be applied differently depending on the task's demands.

It has been argued that in order to effectively use PPRs, a performer should acquire these PPRs techniques as early as possible while in the process of learning relevant skills (Lidor et al., 2000). Lidor and Mayan (2005) suggest that the benefits of developing PPRs early on in the learning process include helping in developing a plan of action and in activating appropriate physical and cognitive processes. In this manner, learners would know how to manage their own cognitive processes and how to analyze themselves and situational demands.

Coterrill (2010) states that research in exploring PPR behaviours, techniques and strategies in sport has specifically focused on psychophysiology - recording the duration, order and instances of certain categories of behaviours. Psychophysiological methods have also been used as an alternative to self-report measures when studying psychological processes during preparation for performance. This psychophysiological measure has been described by Lawton et al. (1998) as an effective way of observing and measuring mental processes during real-time performance. The study also suggests that this measure could be then related to the underlying processes of the nervous system during PPRs.

The psychophysiological methods best suited to the study of mental processes during real-time performance and preparation are the use of electroencephalography and heart rate changes (Cotterill, 2010). Singer (2002) states that elite athletes and performances can be distinguished from other athletes and performances on the basis of the psychophysiological evidence in the pre-performance state. In fact, in Boutcher and Zinsser's (1990) study, results indicate an association between greater cardiac deceleration prior to performance with superior putting performance in golfers. In addition, Radlo et al.'s (2002) results show that the worst dart shots were associated with a significant increase in heart rate.

Other measures of underlying psychological processes and strategies are the use of electrodermal indicators to explore cognitive functions, and electroencephalography (EEG) as an indicator of neural function (Cotterill, 2010). In a study by Crews et al. (1998), EEG measures of automatic, successful performance confirm that low levels of activity happen in various areas of the brain immediately prior to initiating the stroke during a golf putt. This reinforces previous research which suggested that increased alpha activity (a more relaxed state) was related to reduced error and that a quieting of the left hemisphere of the brain appears important for successful performance (Cotterill, 2010). Understanding EEG data in relation to the pre-performance period could offer a greater understanding of the psychological strategies employed by performers.

Research in PPRs exploring performers' psychological techniques and strategies has also been conducted through the use of interviews. However, the interview-based approach to explore athletes' thoughts and perceptions is sparse. Cohn et al. (1990) assessed three male golfers on percent of mental and behavioural pre-shot routines completed during baseline and treatment conditions, and then interviewed them post-treatment to investigate whether they engaged in pre-performance routines and the frequency with which they did so. Lidor and Mayan (2005), examining the effectiveness of pre-performance routines in learning self-paced motor skill in volleyball used brief interviews to explore the benefits of pre-performance routines in beginners. These studies, however, did not investigate athletes' view on the psychological strategies they adopted, the reasons behind adopting these strategies, and the functions they were perceived as having.

Studies which have interviewed athletes asking them about their experience of pre-performance routines are few. Studies include a case study of a professional golfer (Shaw, 2002) and a case study involving two professional cricketers (Cotterill, 2011) in which the process of developing and implementing pre-performance routines is outlined. Another concerns a case study involving an elite rugby kicker in which Jackson and Baker (2001) investigated the consistency of the player's pre-performance routines by analyzing them over kicks of varying difficulty. The participant was then interviewed about the physical and mental preparation for goal kicking. Results showed that the athlete incorporated a number of psychological skills such as cueing, imagery and thought stopping, but did not do so consistently. Results also showed that the player strove for temporal consistency in the pre-performance routines.

Other studies include Hanton and Jones (1999a) research investigating skills and strategies employed by 10 elite swimmers to help them positively interpret their pre-race feelings and thoughts. Athletes were interviewed using semi-structured interviews and results showed athletes reported on elaborate pre-competition routines which included physical and mental strategies. The functions these were perceived as having centered around enhanced focus, a feeling of being mentally and physically prepared for performance, feelings and perceptions of control, and the possibility of reviewing goals and strategies. In another study investigating the nature of pre-performance routines in golf (Cotterill et al., 2010), six male elite golfers were interviewed individually to better understand athletes' perceptions of the nature and function of their pre-performance routines. Data were thematically analyzed using Interpretative Phenomenological Analysis (IPA) forming 9 super-ordinate themes. Results showed that routine development is dependent on personality, situational appraisals and coping resources. Otto et al.'s (2014) research investigating pre-pitch routines in seven professional baseball players including an investigation into their thoughts on the routines and their reasoning behind them also included semi-structured interviews with an exploratory interview design.

1.2.3 Pre-Performance Routines across Performance Domains

As can be seen in sections 1.2.1 and 1.2.2 above, the existing literature relating to routines advocates a number of potential ways in which PPRs can aid performance. However, many of these studies have been questioned in terms of their design and applicability to real performance environments. Research on PPRs, moreover, has hardly ever focused on the experience of the performer, and the research that has kept the performer in mind has always had a limited number of participants. The study by Hill et al. (2011) on alleviating chocking in elite golfers, for example, suggested that effective PPRs might influence performance but results were based on only two participants.

An example of research with the performer as its focus with a slightly higher number of participants is Vergeer and Hanrahan's 1998 study exploring pre-performance routines in professional modern dancers. In this study 11 dancers were interviewed about the methods they used to prepare for performance using an open-ended format. Data analysis involved breaking down the transcribed text into meaningful segments which were then tagged according to type of technical strategy described, as well as to the time, location, purpose and effect of usage. Segments with text with similar tags were then sorted into broader categories and a table constructed providing an overview of techniques and strategies used in preparation for performance. These strategies and techniques were divided into four. The first were strategies aimed at managing time and energy, which included (i) time management strategies and (ii) energy management strategies. The second were techniques and strategies aimed at establishing a mind-body connection, which included (i) letting go techniques, (ii) giving instructions to the body, (iii) focusing on kinesthetically feeling the body, (iv) imaging from an external perspective, (v) doing Tai Chi movements, (vi) using filing up imagery, and (vii) chanting. The third section was sub-divided into three, the first being techniques and strategies aimed at disconnecting from everyday life, which included (i) seeking social support, (ii) dissociating from self, (iii) focusing on the mind-body connection, and (iv) establishing a transition routine. The second sub-section were rituals, which included (i) personal rituals and (ii) social rituals, while the third sub-section were cognitive and meta-cognitive strategies directed at regulating nervousness. These included (i) recalling reasons to feel confident in one's abilities, (ii) not performing for ego-enhancement, (iii) lowering performance expectations, and (iv) putting faith in religious practices. The last section was divided into two. The first were rehearsal techniques aimed at connecting with the content of the choreography, and the second were techniques and strategies aimed at connecting with the intent of the choreography. This was sub-divided into the following: (i) putting on costume and/or make up, (ii) using inspiration imagery, (iii) combining physical and mental exercises, and (iv) trusting well-rehearsed associations.

PPRs have also been adopted by other performance domains such as business and the performing arts (Cotterill, 2015). Research conducted separately in such domains suggested that the cognitive processes which ensure that performers can execute their skills effectively under pressure were the same (Burke, 2010). As a result, understanding effective preparation to perform under pressure across performance domains is important. In a study by Jordet and Hartman (2008), for example, soccer players who missed penalty kicks in international competitions had significantly faster preparation times and more escapist behaviour than the players who scored successfully. Miklaszewski's (1989) study comparing expert and non-expert pianists also showed this difference between expert and non-expert performers. The professional pianists in Miklaszewski's (1989) study differed from the music students in the time spent planning for their performance. Jordet and Hartman's (2008) study, as well as Miklaszewski's (1989) study suggested that the pre-performance period is of paramount importance in underpinning effective performance under pressure.

Effective preparation for performance is crucial in preparing for performance and in helping the individual cope with the pressures and stress of performance (Cotterill, 2015). It is therefore important to maintain an optimal psychological state during the pre-performance period if an individual is to perform well (Kao et al., 2013). A study by Arora et al. (2010) about the impact of stress on surgical performance showed that the operating theatre can be a highly pressurized environment in which surgeons meet with various stressors including technical complications, time pressures, equipment failures, evaluative threat, distractions, and of course, performance anxiety. This study suggested that effective preparation was paramount in determining the surgeon's ability to cope with the stressors that the operating theatre presented. The ability to make the most out of a surgeon's skills and attributes, and the ability to apply them under pressure is an important concept which has also been explored in sport with the impact of PPRs on choking (Mesagno & Mullane-Grant, 2010).

Wetzel et al.'s (2006) study is another investigation into the perceptions of surgical stress, the impact it has on performance and the strategies employed to cope with it, employing semi-structured interviews with 16 junior and senior surgeons. A cognitive-behavioral theory-led topic guide was used to ensure consistency between interviews. Transcripts were analyzed using a grounded theory approach, key themes were identified and coded and then linked into a thematic structure. Findings showed that stress impaired judgment, decision-making and communication, and that although junior surgeons showed uncertainty about their coping abilities, senior surgeons had developed sophisticated strategies for alleviating stress. The researchers noted that employing this interview method allowed them to explore the experiences and perceptions of surgeons on a deeper level. In so doing, they acquired a breadth of understanding that would have been beyond the scope of a survey.

According to Cotterill (2015), while the importance of preparation to perform is recognized across a number of performance domains, there is little research that has considered the approaches adopted across professions. This is so despite the highlighted potential links between performance-focused professions in the literature. To this end, Cotterill's 2015 study explored preparation strategies in 18 performers from the domains of sport, performing arts and medicine with the aim of finding similarities in the techniques and strategies adopted. Participants were interviewed on their preparation strategies and on the functions these strategies fulfilled. Data were thematically analyzed using IPA as this method best described the issues and meanings that were apparent from the interviews. Cotterill's reasons for using IPA were various. These included IPA being a methodology that allowed for individuality and flexibility of approach, and for progressive detail in analysis. Cotterill made initial notes annotating anything that seemed interesting or important, and documented emerging theme titles. These were then transformed into concise phrases which captured the qualities of the various annotated points and then connections were made between the emergent themes and his interpretations. The emergent cluster of themes were developed in a table of themes, and a final table of super-ordinate themes was constructed. In the end, these sub-ordinate themes made up the narrative where each one was expanded upon. The IPA analysis for the data highlighted six super-ordinate themes which were: physical and mental preparation components, influencing factors, preparation function, mindset, and the development of technique.

The following sub-section will review and analyze Cotterill's (2015) study dealing with what approaches are utilized in preparing to perform in specific domains, and whether these approaches can be successfully transferred across performance domains. The second sub-section will review the factors that influence PPRs as well as the functions of PPRs in Cotterill's (2015) study.

1.2.3.1 Mental and Physical Strategies in PPRs across Performance Domains

Cotterill's (2015) study showed that there were similarities across professions in the mental preparation approaches adopted. The specific mental skills adopted by the various performers included self-talk, visualization, focusing strategies, and relaxations strategies such as controlled breathing, yoga and meditation. This study, however, highlighted the fact that while for fine tasks instructional self-talk was more effective than motivational self-talk, the opposite was true for tasks which were less fine. This study also showed that while providing a specific focus to aid concentration was an important factor in preparing for performance, strategies to distract attention from the task at hand were also effective.

Visualization resulted in having different uses for performing artists and athletes. The study also showed parallels between performing artists and musicians, and between sport and surgery, in performers' interpretation of imagery. This suggests that there might be stronger links between some professions than others. In fact, Cotterill's (2015) study showed that the more creative performers such as musicians and actors used imagery for motivational reasons, such as calming down and putting oneself in the right frame of mind, rather than for cognitive purposes. On the other hand, the more functional performers from the fields of sports and surgery, engaged in more cognitive forms of imagery. It was suggested that this might be due to the extensive rehearsal required due to the complex movements needed in these domains. While a number of participants in this study stated that they were either told about or were taught visualization techniques, others developed their ability to visualize as a way of coping with the demands of the situation. Another intervention particularly used in the performing arts was relaxation meditation, yoga and specific breathing techniques seemed to be effective steps in calming down, relaxing, focusing and clearing the mind.

While the aforementioned mental skills in the pre-performance phase were similar across domains, the physical skills varied according to particular demands. Participants in Cotterill's (2015) study stated that they adopted specific and functional behaviours linked to the performance they were about to undertake. While musicians, for example, needed to stretch their fingers, tune the violin, check the bow, run through some scales and then work their fingers before performance, athletes needed to take a long stare at the target and then look back at the ball a number of times, before taking the kick. Performers also agreed about needing to feel physically ready before performance as they perceived this to increase the likelihood of a successful performance outcome.

Cotterill (2015) states that performers link the importance of rhythm in movement and how movements feel in their execution and timing, with the notion of feeling physically ready to perform. This is especially true for those participants whose performance is characterized by rhythmic behaviours such as in the case of shot putt athletes who need timing before performing the shot. According to Cotterill, the notion of feeling ready to perform is also particularly important when considering performers' beliefs in their self-efficacy to perform. This is due to the fact that the higher the self-efficacy, the more successful a performance outcome is. According to Hays et al. (2010), the impact that the feeling of the movements prior to performance has upon a performer's confidence in their ability to perform influences the way a performer feels and how high their self-efficacy is.

Cotterill (2015) concludes that while there were similarities in the mental approaches across domains making these strategies transferable, the physical aspects varied according to the particular demands of the task, making these not transferable between domains. This study is innovative in looking for general approaches to pre-performance routines across domains and uses meticulous method in examining them, including the reasons behind their use and the functions they are perceived as having.

1.2.3.2 Influencing Factors and Functions in PPRs

Some of the factors that influence the quality of performance also impact the quality of preparation for performance. One such factor is fatigue resulting from a lack of sleep, and the other is physical and mental fatigue from engagement in performance (Cotterill, 2015). As Kellman (2010) suggests, fatigue effects cognitive performance with a detrimental effect on the performer's analytical skills and decision-making processes. Besides fatigue, the accumulation of greater experience is also an influencing factor. In fact, despite having been taught specific approaches in the pre-performance stage, many performers in Cotterill's (2015) study adapted such approaches over time to meet specific individual performance needs. Performers stated that through developing a greater understanding of their optimal performance state, they also sought to prepare for performance in a way which maximized the likelihood of achieving their optimal state. However, while performers prepared the best they could in their pre-performance stage, they were also aware that there was the potential that something might go wrong.

Cotterill (2015) states that live adaptation skills are crucial to be able to solve the problem as it comes, settling on an effective course of action and carrying on as if nothing has happened. This aspect of adaptation is an important aspect of decision-making during performance. Muller et al. (2006) suggest that expert performance occurs at the limits of human performance with time constraints having a significant impact upon perception and the resulting action. The ability to rapidly re-select an adequate solution to the presenting difficulty is what separates the very best performers from the rest. Although the performers in Cotterill's (2015) study adopted a number of similar techniques to prepare for performance, the perceived function that these strategies had was not uniform across performers. Different participants, for example, highlighted the importance of their preparation interventions to: enhance confidence; as a means of warm-up; as a way to facilitate good performance by priming relevant movement patterns; to get into character; to have a motivating effect; to oxygenate the brain.

A shared idea between performance domains is that PPRs help one get into character (Cotterill, 2015). Performing artists, for example, prepare for performance by getting into their character prior to it, taking on that personality and adopting behaviours intrinsic to it. Another important function of PPRs is reminding performers why they enjoy doing what they do, as this reduces the perception of stress. Other important factors include the involvement of the performer in the situation, adopting a positive approach to performance, and having a clear motivation for continued involvement in the performance setting. Finally, having an optimal mindset is key when engaging in preparation activities and strategies. This, coupled with keeping calm under pressure is a crucial characteristic of a good performance mindset which allows for flow states to happen in the elite performer (Cotterill, 2015).

All in all, Cotterill's (2015) study showed that there appeared to be stronger links between certain performing domains than in others. It also highlighted the fact that since some performance strategies were adopted across some domains, the sharing of approaches and developmental strategies could offer performance benefits where strategies were currently under-utilized in other domains. This was true of the mental strategies adopted by some performers as these strategies seemed to be rather consistent across domains. The physical strategies in pre-performance, however, appeared to be context-specific and therefore, not transferable to other performance domains.

1.2.4 Pre-performance routines in Music

Within music, few studies have explored PPRs in any depth. According to Clark et al. (2014), most research has in fact only made a passing reference to PPRs in relation to other topics. Talbot-Honeck and Orlick's 1998 study exploring the mental factors relating to musical excellence in elite classical musicians, for example, employed a 25-item, open-ended topic guide and interviewed 16 musicians with national and international performance experience. To explore their topics of interest they addressed aspects which included goals, performance preparation, focus during performance, and best and worst performance. Transcripts were analyzed to determine common themes and categories which included a deep commitment to music and/or excelling, non-materialistic goals, a strong sense of self, a positive perspective which was based on learning and growth, and a love for music and music making. Although this research did not focus on pre-performance routines, there is sufficient overlap for informed suggestions as to the types of areas to be explored in the present thesis.

Partington (1995) also mentioned PPRs when he observed that, prior to performing, elite musicians employed a variety of clearly constructed pre-performance routines. He stated that these could involve mental and physical activities in the days leading up to performance, adequate nutrition and rest, and a variety of physical and mental warm-up exercises in the hours prior to performance. He suggested that these activities could have several effects: helping musicians feel mentally prepared and confident in their abilities, attaining an appropriate level and focus of concentration, providing a sense of control, and ensuring that performers are physically relaxed and limber while still aroused for performance. Partington noted that many of the elite classical musicians in his study had developed their PPRs through the course of their experience. Nonetheless, no details were provided as to the PPRs used or the function these have on performance.

Clark et al. (2014) also touched upon PPRs in their study investigating mental skills in performance. In their interviews with 29 conservatoire and professional musicians, they concluded that PPRs were idiosyncratic but generally included forms of mental and physical warm-up. They also noted that performers adopted PPRs to cope with nervousness through associative or dissociative strategies and to achieve focus to get into the mood of the music about to be performed. The more experienced performers were found to show greater clarity and conviction in the content and function of their adopted PPRs, while the less experienced musicians were able to discuss a broad range of adopted activities despite at times lacking the conviction of the experienced musicians. Clark and colleagues suggested that this clarity could develop through more experience and reflection.

Another more recent study touching upon PPRs is that by Kegelaers et al. (2022) which investigated practice and performance management strategies in eight emerging professional musicians preparing for orchestral auditions. The study consisted of semi-structured interviews conducted before participants received their audition material and date, and of semi-structured monitoring interviews in the 28 days leading up to the auditions. Results showed that emerging musicians used different practice and performance management strategies which included relaxation, imagery, practising under pressure, cognitive refraining, attentional control, substance use and routines. Findings also showed that emerging musicians differed in the type of practice and performance strategies used, and that there was great variation in the strategies used. Besides a brief mention of routines as one of the performance management strategies used by emerging musicians and that these seemed to enhance confidence and control over performance, there is no further mention of what these routines were, how they were adopted or how they were perceived to help with confidence and control by the emerging musicians. There is scope, therefore, for this research to explore these avenues.

In a study of performers and performance anxiety in the 1990s, Roland (1994) interviewed 30 successful musicians from the classical and jazz fields. Although the primary focus of this research was performance anxiety, this study remains the only one that explores PPRs in any depth. Data analysis was carried out using text searches, code and retrieval operations allowing the researcher to gather information on a particular issue from all the interview data. A compilation of comments on topics such as relaxation, used as a strategy for coping with performance anxiety, was then made and analysed. Analysis of these semi-structured interviews showed that performers adopted a number of short-term and long-term strategies to manage performance anxiety. Roland noted that musical strategies and lifestyle choices were adopted by musicians for the long-term, while cognitive and behavioural strategies were short-term strategies adopted closer to the day of performance. Cognitive strategies included positive self-talk, task-oriented thinking, goal setting, mental and visual rehearsal, and loss of self. Behavioural strategies comprised breathing techniques, relaxation, physical activity, and spending time alone.

Roland (1994) noted that these behavioural strategies were adopted by performers to maintain optimal physical arousal and reduce tension prior to performance. He suggests that these strategies are taught to aspiring musicians to make up for the otherwise insufficient assistance students are given with regards to coping with performance anxiety. Although Roland’s insight into these strategies is invaluable, the PPRs in this study were only explored through the lens of performance anxiety and were therefore not examined in their entirety and to their full potential. More research needs to be carried out to examine and test which PPRs are used and what functions they are perceived as having.

While there is no existing research investigating the breadth of pre-performance routines across performers, there are studies concerning music-related topics which include an exploration of pre-performance routines in a broader population. The first of these is a study by Steptoe and Fidler (1987) exploring performance anxiety and the cognitive and behavioural strategies employed by the 146 professional, student and amateur orchestral musicians. These strategies were explored through questionnaire methods and the researchers assessed music performance anxiety in relation to behavioural and cognitive strategies, everyday fears and neuroticism. Findings included a significant difference in performance anxiety between the groups of musicians, with the highest rating in the students and the lowest in professionals. Results also showed no significant differences between groups in neuroticism, extraversion, lie scale or total ratings from the fear Survey. It is unclear, however, how these cognitive and behavioural strategies were selected and assessed as the authors omit information in this regard. Moreover, the analysis of the behavioural strategies and the 20-item self-statement questionnaire investigating cognitive strategies is limited to the themes and strategies relating to stage fright and does not address other themes and strategies related to performance, such as visualisation. This leaves a gap in the literature as to what functions, besides that of controlling performance anxiety, behavioural and cognitive strategies have in performance.

The study by Wolfe (1990) also investigated music performance anxiety through strategies used prior to performance. This was a survey study including several measures of state and trait anxiety, with personal factors such as gender, age, main instrument, number of years studying the instrument, number of years playing professionally, and performing scenario (large ensemble, small ensemble, solo). It also consisted of an open-ended item asking respondents (193 amateur and professional musicians) to describe strategies they found effective in coping with performance anxiety. Content-analysis was used to identify strategies into either problem-focused or emotion-focused strategies. Emotion-focused strategies included (i) deep breathing/relaxation/physical activity, (ii) immersion/concentration on music, (iii) minimizing the importance of the performance, (iv) positive self-talk/self-acceptance, (v) prayer/meditation/imagery visualisation, (vi) communication with audience/giving gift to audience, (vii) seeking/giving support within the ensemble, (viii) using drugs/alcohol before performance, and (ix) engaging in distracting activity before performance. Problem-focused strategies included (i) thorough preparation/practice/coaching, (ii) logistics of performance (such as making sure that things like instrument is properly arranged), (iii) attention to performance hygiene (such as rest, fitness, diet), and (iv) appropriate selection of music. Results showed that most strategies were emotion-focused and that musicians whose predominant coping style was emotion-focused reported feeling more confident and competent during performance and had less disruptive cognitive activity than those using problem-focused strategies. Wolfe also reported that the coping strategy used the most was deep breathing/relaxation/physical activity and thorough preparation/practice/coaching. Although this study did not have PPRs as its focus and did not explore the use of PPRs in performance, it remains the most comprehensive quantitative study that includes PPRs in musicians.

In another study touching upon pre-performance routines, Holmes (2005) employed semi-structured interviews to investigate how the development of instrumental technique impacted musicians' learning and memorization processes. This method encouraged participants to elaborate on their ideas and perceptions allowing the researcher to better understand participants' working methods. Data analysis was carried out using IPA and Grounded Theory. Results showed that on the whole, the practice strategies between instrumentalists (a guitarist and a cellist) were the same, and that these were generated by interpretative goals.

As Clark et al. (2014) noted, relatively little is known about how elite musicians prepare for performance. This despite research that has found that elite musicians employ clearly constructed performance preparation routines prior to performance (Partington, 1995; Clark et al., 2014). Connolly and Williamon (2004) also suggested that younger musicians should be supported in adopting PPRs when preparing for performance. Clark et al. (2014) stated that, given the support given to PPRs in the various performance domains, developing an awareness of the types of pre-performance activities musicians adopted prior to performance could be beneficial in music performance training. Cotterill (2010) also suggested that more mixed designs are required to test some of the hypothesized functions of PPRs.

In the music domain it is common practice to investigate how elite musicians practice and perform to transfer knowledge to less experienced musicians and aid their development (Rife et al., 2000; Kegelaers et al., 2021). Study 1 (Chapter 3) responds to these needs by exploring pre-performance routines in professional orchestral musicians.

1.2.5 The application of pre-performance routines in the music domain

In recent years, there has been a relatively small growth of literature showing the benefits of psychological skills training (PST) for musicians. As Hawkes (2021) states, the majority of this research focuses primarily on reducing MPA with additional aims to improve performance quality (Hoffman & Hanrahan, 2012; Braden et al., 2015; Kenny & Halls, 2018), performance preparation and practice (Hatfield, 2016), wellbeing (Steyn et al., 2015) and to facilitate flow (Cohen & Bodner, 2019). Despite the difficulty in drawing solid conclusions from these studies due to the differing samples, programme content, and programme delivery time, the overall benefits of PST for musicians are a reduction of, or better management of MPA, improved performance preparation, and sometimes, improved performance quality.

One of the strategies used in these PST programs is the use of pre-performance routines. Among the research concerning pre-performance routines, Broomhead and colleagues (Broomhead et al., 2010, 2012, 2018) tested a pre-performance routine intervention to measure musical expressiveness. In all three studies, a group of singers were instructed by a psychologist to think of positive trigger words while inhaling and exhaling comfortably. Results showed that musical expressiveness was improved in both the 2010 study with non-expert adult singers, and in the 2012 study with junior-high school age singers. However, only the adults were found to have sustained the improvement over a long period. In the 2018 study, junior singers had this pre-performance routine implemented by their teachers who then also provided follow-up lessons to help them with retention. Results showed that the follow-up sessions helped retention and that the pre-performance routine could be implemented by teachers after an hour of training in the PPR.

Osborne et al.'s study (2014) on managing performance anxiety and improving mental skills training consisted of 31 conservatoire students attending two lectures and a masterclass in performance psychology techniques. Centering was used as a possible pre- and mid-performance routine to refocus attention and regulate excessive autonomic activity. Results showed that the intervention significantly reduced participants' self-reported performance anxiety, improved performance preparation and had positive effects on well-being, self-confidence, courage, focus and concentration.

More recently, Hawkes (2021) investigated pre-performance routines as part of a project designed to introduce psychological skills training in piano lessons as a prevention to performance anxiety. In this study, pre-performance routines were taught by six piano teachers to 34 recreational pianists. The teaching happened in two cycles of action during two consecutive school terms in the 4 weeks leading up to performance. The taught pre-performance routines were then evaluated by both teachers and students. Results suggested that pre-performance routines improved concentration and helped achieve a sense of calm. In another study, Tief and Gropel (2021) developed a 5-week intervention programme where 15 violin students practised their individualized pre-performance routines based on the centering technique while another 15 applied a goal-setting intervention while practising. Students' performance was then measured by self-evaluations and five expert jurors. Results showed that while both interventions were perceived as helpful by participants, there was no significant result for performance quality. The group of students who practised pre-performance routines, however, scored higher in self-efficacy than the goal-setting group.

The above-mentioned research concerns intervention programs created to investigate the effects on music performance of specific pre-performance routines selected by the authors. In so doing, such research removes its target audience from centre stage by choosing to investigate pre-determined pre-performance routines without first exploring which pre-performance routines musicians already engage in and which pre-performance routines musicians might be more inclined to adopt. This may depend on a variety of factors such as individual preferences, perceived functions of the adopted pre-performance routines, lifestyle routines and time constraints. Clark and Williamon (2011) state that as musicians are often reluctant to dedicate part of their practice time to other non-playing activities, intervention programs should be minimal in duration.

For the above reasons, it is important that research invests in groundwork on pre-performance routines musicians use before creating other intervention programs concerning such routines. This thesis therefore provides this groundwork by aiming to (1) explore the breadth of pre-performance routines in the music domain, (2) understand the reasons behind such engagement (3) explore the functions these are perceived as having and (4) understand their importance in classically trained professional musicians. These findings would benefit music-related research and research more generally in creating an awareness of the types of routines employed by professionals. Research has shown that elite musicians display greater clarity and conviction in the content and function of their respective pre-performance routines than amateur or student musicians. Less experienced musicians, on the other hand, have been found to be eloquent in discussing the broad range of activities they employed but lack the conviction found in professionals. Clark and Williamon (2011) suggest that such clarity to be the result of greater experience and reflection. In investigating effective pre-performance routines in professional performers, therefore, this thesis aims to shed light into the pre-performance routines of expert performers to help music students who, according to Connolly and Williamon (2004), need to be supported in constructing their own pre-performance routines. An implication of this is that there is scope for pre-performance routines to be discussed and encouraged in conservatoires to help music students optimize their performance. As Cotterill (2014) points out, applied studies that implement development programs based on research on pre-performance routines, should be prioritized. Future research could examine the benefit of this teaching on the development of student performers.

1.3 Maladaptive and Facilitative Music Performance Anxiety

Now deep in the heart of a lonely kid
Who suffered so much for what he did,
They gave this ploughboy his fortune and fame,
Since that day he ain't been the same.

See the man with the stage fright
Just standing up there to give it all his might.
And he got caught in the spotlight,
But when we get to the end
He wants to start all over again.

I've got firewater right on my breath
And the doctor warned me I might catch a death.
Said, "You can make it in your disguise,
Just never show the fear that's in your eyes."

Now if he says that he's afraid,
Take him at his word.

And for the price that the poor boy has paid,
He gets to sing just like a bird, oh, ooh ooh ooh.

Your brow is sweating and your mouth gets dry,
Fancy people go drifting by.
The moment of truth is right at hand,
Just one more nightmare you can stand.

(*Stage Fright*, The Band, 1970).

The above extract is taken from the song *Stage Fright* by The Band, which captures the essence of music performance anxiety (MPA). The lyrics talk about a young man who invests "all his might" in his craft but does so at the great personal cost of "stage fright". He fears the "spotlight" and is hardly ever satisfied with his performance; in his quest for a non-existent perfectionist standard, "when he gets to the end, he wants to start all over again". His musical success has brought him "fortune and fame", but his emotional life has suffered; there is in fact a suggestion that something in him has been lost and that he has never been the same since he attained success. He is now a "lonely kid" who must "never show the fear that's in [his] eyes" whenever he is caught in the spotlight. This creates a conflict in him since performing becomes both the prized and the feared object. He deals with this emotional distress by self-medicating with "firewater", a strong alcoholic drink. Every performance that he gives is accompanied by the somatic symptoms of intense anxiety: his "brow is sweating" and his "mouth gets dry", he worries about the audience's reaction to his performance, and he fears being exposed as a failure in his craft when the "moment of truth" arrives. Despite all of this, he prepares himself for the next performance and for "one more nightmare". The plight of this performer reflects the cycle of music performance anxiety (MPA) for many music performers.

MPA does not afflict only popular musicians. Classical musicians also suffer from it, from Frederic Chopin who insisted he was not fit to give concerts because the audience intimidated him (Zdzislaw Jachimecki, 1937) to mezzo-soprano Tatiana Troyanos who talked about the tension she felt onstage (Myers, 2002). Other performers, on the other hand, feel positive and energized while performing in public. International tenor Joseph Calleja, for example, talks about performance in terms of a "mélange [of] communication, the acting on stage, how much involved I [am] with the character, how good the singing is", ingredients which help him transform performance into "pretty much a party" (Zammit, 2012).

As can be seen above, the experience of performance varies vastly amongst performers. In the description given by Calleja, the focus of experience is inwards, revolving around his subjective and sensory experience. He talks about the emotional high during performance as well as about the feeling of being in control which gives him greater freedom through which his musical intention can be realized. Calleja also mentions the auditory perception of the music he hears, as well as the heightened awareness and connectedness he feels between himself and the music (Zammit, 2012). On the other hand, Chopin's and Troyanos' descriptions focus outwards, not so much on the music but on the audience. Chopin talks about how the audience made him feel, paralyzed by its curious glances and feeling like he was struck by the strange faces (Zdzislaw Jachimecki, 1937). Troyanos' concerts, on the other hand, fizzled out. As her career progressed, she cancelled greater numbers of performances due to her increasing inability to face the paralyzing anxiety that accompanied her performances (Myers, 2002).

This is not to say that a performer who focuses on the audience will necessarily suffer from MPA. Calleja, for example, talks about how the attunement with his audience can enhance performance, creating "magnetism" and "magic" (Zammit, 2012). In performance, despite a performer's anxiety, one can experience exhilaration while playing. This heightened state co-occurring with MPA has been termed as "peak performance" or "flow" (Steptoe, 2001; Biasutti, 2011). During this time, the performer has a sense of an effortless performance and is totally immersed and focused on making music to the exclusion of other environmental or internal stimuli. Flow takes place when the challenges are matched with the necessary underlying skills and when these skills are honed to achieve mastery (Kenny, 2011).

1.3.1 MPA: Definition and Influencing Factors

There are many definitions of MPA in the literature, but Kenny's (2011) definition will be the one adopted for the purposes of this thesis as it distinguishes between performance anxiety and social phobia. It also recognizes that although both conditions share common features, they are also significantly different. This definition is more consistent with current knowledge of MPA and as Kenny (2011) states, it aligns with research on the anxiety disorders in general and on social phobia in particular. MPA is:

> *[t]he experience of marked and persistent anxious apprehension related to musical performance that has arisen through underlying biological and/or psychological vulnerabilities and/or specific anxiety-conditioning experiences. It is manifested through combinations of affective, cognitive, somatic, and behavioural symptoms. It may occur in a range of performance settings, but is usually more severe in settings involving high ego investment, evaluative threat (audience), and fear of failure. It may be focal (i.e. focused only on music performance), or occur comorbidly with other anxiety disorders, in particular social phobia. It affects musicians across the lifespan and is at least partially independent of years of training, practice, and level of musical accomplishment. It may or may not impair the quality of the musical performance.*
> (Kenny, 2010, p.433)

Along the years, a numerous amount of research has concerned itself with MPA. This is because there is a high reported incidence of maladaptive pre-performance anxiety in musicians and there is recognition of the debilitating effects that anxiety can have, both on one's performance and on the overall well-being of the performer (Steptoe, 2001). Contributing factors to MPA can be classified into three categories, namely, factors influencing performers' susceptibility to experiencing MPA; factors influencing performers' task efficiency; and factors relating to the performance environment (Papageorgi et al., 2007).

1.3.2 Factors Influencing a Performer's Susceptibility to Experiencing MPA

The degree of susceptibility to experiencing anxiety can influence performers' perception of the situation and their preparation procedures. Both susceptibility and the degree of sensitivity to anxiety are attributed to a performer's characteristics which may include intrinsic, extrinsic and cognitive features. Intrinsic characteristics of a performer include gender, age, personality, sensitivity to evaluation by others, trait anxiety, self-efficacy beliefs and self-concept. Extrinsic characteristics may include the extent or level of individual performing experience and the quality of previous experiences. Cognitive characteristics may influence a performer's vulnerability to MPA, including their cognitive style, intelligence, metacognitive skills, beliefs about learning and ability, attributional style and their outcome expectancies (Papageorgi et al., 2007).

The gender of a performer as an intrinsic characteristic has been reported to be linked to the susceptibility to MPA. In a study by Abel and Larkin (1990), for example, female performers were found to be more likely to experience high levels of MPA and to perceive the presence of an audience as more threatening than their male counterparts (LeBlanc et al., 1997). As Kenny and Osbornes's (2006) study on music performance anxiety in young musicians showed, the above is true even for children and adolescents. Hallam (1998) also suggests that age plays an important part in studying music performance anxiety as adolescence seems to be a particularly vulnerable period for MPA.

Individual differences and personality factors also play an important role in MPA. Kemp (1996) suggests that introversion, for example, is usually seen as a useful characteristic for performers due to the ability to withdraw in an inner mental life while providing the single-mindedness necessary for technical skills. However, this may also induce serious anxiety as introverts seem to have a lower threshold of arousal. This suggests that introverts cannot cope as effectively with high levels of arousal as extroverts. Reubart (1985) also talks about the importance that a performer's self-esteem has on MPA. He suggests that an individual's low self-esteem may be triggered by a bad performance or might be deeply rooted in feelings of personal unworthiness. In such cases, a minor mistake during performance may set the tone for excessive anxiety each time the performer is faced with the task of performing. Mor et al. (1995) point at how setting very high personal standards and having perfectionist views are also associated with debilitating MPA.

Trait anxiety is another personality trait which influences MPA. According to Wilson (2002), trait anxiety has an important relationship with the evidenced state anxiety. Cox and Kenardy's (1993) study supported this since it reported a positive correlation between general trait anxiety and MPA, thus suggesting that the more an individual is likely to be generally anxious (trait anxiety), the greater the level of anxiety in a particular situation (state anxiety). Papageorgi (2007) mentions the importance of having a positive self-concept in music performance as it can be important in maintaining confidence and self-esteem. These are two characteristics which are seen as guarding against the experience of maladaptive performance anxiety.

Among other personality traits is self-efficacy. Bandura (1977) suggests that self-efficacy and anxiety are related since confidence in the ability to perform interacts with the performer's subjective, autonomic and behavioural anxiety. Thus, reduced confidence in one's ability to perform is believed to result in self-defeating thoughts, distress, diminished behavioural mastery and increased arousal (Bandura, 1982). McCormick and McPherson's (2003) study on self-efficacy in music suggests that higher self-efficacy has a positive impact on the overall achievement in graded examinations.

Papageorgi et al. (2007) list a number of other factors which influence a performer's susceptibility to experiencing MPA. These are: sensitivity to evaluation by others; negative outcome expectancies; quality of achievement attributions; insufficient development of metacognitive skills; limited performing experience; previous experiences; and occupational stress.

1.3.3 Factors Influencing a Performer's Task Efficacy

Task efficacy is influenced by the amount of work and commitment that a performer puts into the process of preparing for performance. Papageorgi et al. (2007) suggest that task efficacy includes the performers' approach to learning and their motivation. Both of these are related to the difficulty of the repertoire and the performer's own technical, memorization and musical abilities.

Inadequate preparation, or a relative incapacity to master one's repertoire, or to perform from memory, is the first factor which results in low task efficacy, and which increases fear of failure, subsequently resulting in MPA (Papageorgi et al., 2007). Sweeney and Horan (1982) refer to anxiety resulting from inadequate preparation prior to performance as 'reactive anxiety'. Hallam (2003) suggests that performers should plan their performance according to their capabilities and limitations, and that it is necessary for them to feel confident if they decide to play from memory as insecurities may raise anxiety levels.

The motivation for achievement is also very important in task efficiency. Atkinson and Feather (1966) suggest that individuals have a motive to seek and approach success (need for achievement) and at the same time they also have a tendency to avoid failure (fear of failure). In the context of music performance, the motivation behind achievement can be related to the vulnerability of a performer's anxiety, the effort they put into their preparation, and the goals they pursue (Papageorgi et al., 2007). Papageorgi (2007) suggests that the strategies musicians use to cope with their MPA may also be important in how successful they are in controlling their physiological arousal and alleviating potential maladaptive effects of anxiety. Biasutti and Concina's (2014) study on coping strategies and MPA showed that coping strategies based on avoidance and social support were positively correlated with MPA.

1.3.4 Factors Related to the Performance Environment

Papageorgi et al. (2007) state that the characteristics of the performance space play an important role in promoting or reducing anxiety in a performer. Other significant variables include the presence of an audience, the amount of self-exposure and venue characteristics. Empirical studies such as that by Fredrikson and Gunnarsson (1992) confirmed that the presence of an audience increased anxiety in performers. Similarly, Wilson (1997) suggests that the more exposed and vulnerable performers feel, the more anxious they will be. Brotons' (1994) study reported an increase in anxiety when college musicians performed in the presence of peers and critics, performed solo pieces or performed in small ensembles as opposed to large ones. Papageorgi et al. (2007) also suggest that any unsatisfactory performance condition such as physical discomfort, within the performing environment or venue, could cause unexpected obstacles in performance and could increase performers' worry and anxiety. Parasuraman and Purohit's (2000) study, for example, found that one of the major causes of stress among musicians was related to the work environment which included issues with humidity, air quality, seating comfort and readability of the music score.

1.3.5 The Effects of MPA on Music Performance

MPA can manifest itself in two characteristic ways: it may either have debilitating (maladaptive) or facilitating (adaptive) effects (Papageorgi et al., 2007). Adaptive anxiety is interpreted as facilitative when it is viewed as enhancing performance through stimulating alertness and concentration (Kemp, 1996). Maladaptive anxiety, on the other hand, is considered detrimental to performance when it negatively effects performance through factors such as memory lapse or through a sub-standard execution of a well-prepared performance (Gabrielsson, 1999; Steptoe, 2001).

Many theories have been developed that have empirically tested the arousal-performance relationship. Yerkes and Dodson (1908) presented the inverted-U hypothesis, while Lang (2009) gave the three-system model of fear. Kerr (1987) suggested a reversal theory, while Martens et al. (1990) presented a multidimensional theory. Hardy (1990) introduced the catastrophe model of anxiety and performance, and Hanin (2000a) his optimal zones of arousal and hypothesis.

Perhaps the most well-known of these theories is the Yerkes-Dodson law which concerns the relationship between drive and learning. This law states that neither very low nor very high arousal levels enhance performance quality. Consequently, maximum performance quality is believed to be best achieved at medium levels of arousal. According to Wilson (2002), the Yerkes-Dodson law suggests that arousal enhances performance up to a point beyond which deterioration occurs. Wilson (2002) adds that deterioration of performance occurs more rapidly if the task at hand is complex and not sufficiently prepared. Steptoe's 1983 research supported the Yerkes-Dodson law reporting that top performances in both professional musicians and music students occurred while they experienced moderate levels of tension, despite the fact that a moderate level of tension was higher for professionals than for students.

Kenny (2011) states that most studies in music journals report on the Yerkes-Dodson law in its original form without referring to subsequent research showing the complexity of the arousal-performance relationship and its interaction with other significant intrapersonal, situational and performance-related factors. Papageorgi et al. (2007), for example, presents a conceptual framework for MPA that predicts impaired performance at low and high levels of arousal and optimal performance at medium levels of arousal. This model also states that the level of arousal predicts adaptive (medium arousal) or maladaptive (low and high levels of arousal) behaviours during performance, and heightened or reduced self-esteem and other longer-term effects. Kenny (2007) argues that this conceptual framework, however, is flawed as achieving optimal performance in any human endeavour is much more complex than Papageorgi et al.'s model suggests.

According to Carlson et al. (1996), there are four typical ways in which MPA manifests itself, whether singly or in a combined fashion. These are: bodily reactions such as paleness and accelerated heart rate; cognitive reactions which manifest themselves in phenomena such as memory lapses and an inability to concentrate; emotional reactions such as a heightened sense of tension and shame; and behavioural reactions, of which failure of appetite and hyperactivity are examples. According to Kokotsaki et al. (2003), an individual's life-history and experience with various stress-inducing situations, their cognitive processes during performance, the importance given to a situation and the potential physiological and psychological activation, are all factors which determine variations in how MPA as being a threatening situation (Kokotsaki et al., 2003).

Reubart (1985) states that if excitement is but a form of positively expressed anxiety, anxiety can, under certain conditions, be regarded as beneficial to one's health since it supplies vital creative energy. He also suggests that a performer could benefit by moving through anxiety, instead of away from it, in order to achieve a measure of self-realization. In accordance with this, Carlson et al. (1996) state that MPA must be accepted as a natural process as its presence is to prepare the body with the energy, intensity, enthusiasm and tension that it needs during performance. Consequently, they argue, if a performer were to go on stage devoid of these characteristics there would be no transmission of the performer's involvement and commitment, and the audience would be left uninspired and unaffected.

The ability to focus on the intrinsic rewards of an experience instead of focusing on the consequences, also enhances the musician's opportunity of entering a state of flow (Kirchner, 2011). Csikszentmihalyi (1990) describes flow as being a state in which alienation gives way to involvement, enjoyment replaces boredom, helplessness turns into a feeling of control, and psychic energy works to reinforce the sense of self, instead of being lost in the service of external goals. MPA, however, remains the most prevalent form of psychological distress. According to a study by Plaut (1988), 80% of people experienced anxiety whenever they were called on to make any appearance where the attention was focused on them. Ostwald (1987) states that musicians, already prone to the stresses of perfectionism and competition are especially susceptible to MPA and are among the top five occupational groups admitted to mental health facilities.

MPA has in fact been described as one of the most unavoidable and deleterious challenges musicians' face (Wasley et al., 2011). Esplen and Hodnett (1999) point at the considerable number of studies which suggest that a significant number of musicians experience high levels of MPA during their lifetime, which may or may not be related to levels of training and experience. They add that MPA has been associated with poorer performance quality, altered career opportunities, a negative impact on general wellbeing and overuse syndrome.

Caldwell (1990) suggests that a musician who performs in a state of fear is bound to experience one or several physical symptoms. These include an increase in heart rate, quickening respiration and the secretion of adrenaline. Riley (2012) adds that one of these physiological symptoms alone can throw off the most experienced performers if they have no means of combatting MPA. This is an important statement for the purpose of this research because finding a pre-performance strategy that might help with such physiological symptoms would most probably enhance performance.

Besides the physical symptoms triggered by MPA, there are also cognitive and behavioural manifestations which are equally detrimental. Foster (1998) states that the cognitive manifestations of MPA can include ruminations both before and during performance. Such ruminations include self-doubt, projected criticisms or comments from the audience, potential memory lapses, mental focus on technical difficulties, and the consequences of a faulty performance. All of these may be enough to prove distracting and to be self-fulfilling. Foster (1998) also mentions behavioural manifestations which may include the performance quality itself, body language and facial expressions during the performance, and more overt manifestations such as measures taken to avoid the performance situation altogether (Foster, 1998).

1.3.6 Mental and Physical Strategies Adopted by Professional Performers in Dealing with Music Performance Anxiety

The deleterious challenge posed by MPA raises the question as to how professional performers cope. It is often reasoned that the professional success of such performers is due, in part, to the psychological strategies they employ in managing MPA. Steptoe and Fidler's 1987 study on stage fright in orchestral musicians showed that realistic cognitive self-appraisal was most common with musicians reporting medium levels of MPA. Catastrophizing self-statements were used by musicians with high MPA. In a study by Wolfe (1990) surveying amateur and professional musicians on effective strategies used in coping with MPA, deep breathing/relaxation/physical activity, and a thorough preparation/practice/coaching, were the two most common groups of coping strategies.

In an attempt to provide a naturalistic study to examine the strategies employed by successful professional performers in managing MPA, Roland (1994) conducted a qualitative study with performers who were regarded as being successful. In this study, no symptoms of MPA stood out as common to all performers. Among the most frequent symptoms were trembling, tension, increased cardiovascular activity, negative thoughts, hot or cold flushes, nausea, dry mouth, sweating and clamminess. Severe apprehension, distractive thoughts, increased breathing, memory lapses, adrenaline rush and dullness were among the symptoms mentioned.

The three prevalent causes of MPA in Roland's (1994) study were: not being sufficiently prepared; a general sense of insecurity resulting from the performers' personalities or psychobiological states; being unable to perform the music required not because of under-preparation but because of a lack of ability. While all performers stated that they experienced MPA, they also indicated that they were able to keep it in check. In agreement with this, Carlson et al.'s 1996 showed that the large majority of performers perceived MPA as beneficial when they felt things were under control but detrimental when they felt out of control. In addition to this, Roland's (1994) study showed that performers managed MPA by mostly preventing it from happening and by having immediate means of controlling it as it arose.

Similar to the strategies mentioned by Kenny (2011), the performers in Roland's study used a series of strategies to manage MPA. Among the types of cognitive strategies most commonly employed by performers were the use of visual rehearsal, task-oriented thinking, mental rehearsal, positive self-talk and the loss of self, the opposite of excessive self-consciousness. The majority of performers used visual rehearsal in preparing for performance while others used positive self-talk to quell the moments of self-doubt before walking onto stage. Self-talk tended to be used closer to the performance as a way of affirming one's sense of self-worth and preparedness. The performance goals performers set for themselves appeared to have particular importance in managing MPA as they tended to focus their attention away from an audience that was perceived as threatening. A few performers also emphasized the importance of loss of self, which enabled them to see themselves as a vehicle through which the music was played, taking up a role similar to that of an observer. Before a performance, most performers also tried to achieve some type of performance focus which enabled them to think of the mechanics and dynamics of performing, rather than to tasks irrelevant to performance.

Besides cognitive strategies, performers also employed behavioural strategies to maintain their physical arousal at an optimum level and to decrease their muscular tension, particularly on the day of the performance. Slowing down their breathing rate and breathing in a more diaphragmatic way, as well as using some form of relaxation to reduce bodily tension, were among the most common techniques used to prepare for performance. Gaining extra sleep by sleeping in or taking naps, as well as taking it easy on the day of the performance, were also considered important by most performers. Sixty percent of performers carried out physical activity before performing, such as stretching, warm-up exercises, using the Alexander technique, doing finger exercises and yoga. The reasons given behind the physical activity done were to reduce tension, increase blood flow and relax one's muscles. Forty percent of performers, however, did not do any type of physical exercise before performing. On the day of the performance, most performers followed a PPR which allowed control over the build-up to the performance, as well as enabling a greater sense of security. Most performers liked to arrive early for a performance, to take their time to get familiar with the venue and to have some alone time before the audience arrived.

Among the musical strategies employed by performers in Roland's (1994) study was musical preparedness. This was considered to be essential in the management of MPA (thus echoing Albrecht Mayer's advice given in this thesis' Introduction) and long-term preparation was highly emphasized. Practising performing was part of the long-term practice schedule for most performers and musicians did this either by exposing themselves to preparatory performances by playing for family and friends, or my simulating the actual performance. In the last week prior to the performance, many performers varied their practice by doing only enough to keep their fingers or vocal cords in shape. Ninety-seven percent of all performers used mental rehearsal and read through the score in the last week prior to performance. Warming-up prior to the performance was often a part of performers' PPR.

In accordance with Ackermann (2002), who stated that health professionals who work with musicians have often suggested that the physical condition of many musicians may be inadequate to cope with the demands of playing their instrument over extended periods of time, Roland (1994) found performers in his study to not be particularly fit. Although there was a general awareness that physical exercise was important for overall health, some did not see it as being of benefit for performing. Slightly more than half the performers engaged in regular aerobic exercise of at least a moderate level, but interestingly, there was little change in exercise routine as the day of the performance approached. On the other hand, the performers who performed regular exercise, sometimes missed on their exercise before performance because of the extra time taken up by rehearsals. These statements about performers and physical exercise, or rather, the lack thereof, carry important implications for Study 3 found in Chapter 6 of this thesis.

Since musicians are considered athletes of the small muscles (Lederman, 1999) it is recommended that they also perform physical exercise and, as Robson et al. (1995) suggest, fuel their bodies before and after performance. Robson et al. (1995) state that a musician should reduce the amount of fats three months prior to a performance or audition in order to improve body shape and increase energy. Musicians are also encouraged to increase their fibre intake to protect against stress-related gastrointestinal disturbances like irritable bowel. Robson et al. (1995) further state that a week before the event, a musician should eat a highly complex carbohydrate diet while the meal before the actual event should be high in energy but not contain sugars, alcohol or caffeinated drinks. In contrast, the change in diet by professional performers in Roland's (1995) study only amounted to having a major meal some hours before the performance.

Despite the weight that Robson et al.'s (1995) diet suggestions might have it is important to keep in mind that these are recommendations made by the authors in relation to coping with music performance anxiety. It is unclear, however, whether these suggestions have been made from conclusions drawn from empirical studies or whether these statements have been examined empirically.

In a study by Taylor and Wasley (2004), some musicians dealt with MPA through resorting to alcohol, tranquillizers and beta blockers. This also came through in Roland's (1995) study where performers stated that while some reduced their alcohol consumption prior to performance, others continued drinking at their usual levels with one performer reporting an increase in his alcohol intake. Most performers, however, reported not drinking alcohol beyond a certain time prior to performance. The use of beta blockers and other prescribed and non-prescribed drugs were also reported prior to the performance (Roland, 1995).

It is interesting to note that in Roland's (1995) study all performers stated that they had had no formal training on how to deal with MPA, and that their main methods of how to deal with MPA had been through help given from teachers and non-music professionals, advice from colleagues, and through self-exploration by reading and experimenting with different strategies. Most of these performers suggested that there should be discussions around issues relating to MPA and that performers needed to be educated in how to cope with it. Others highlighted the need for specialist anxiety management techniques such as meditation, breathing, relaxation, posture and concentration.

1.3.7 Managing Music Performance Anxiety in Education

The art of performance involves precise muscle coordination. Consequently, students and performers become highly anxious about the act of performing in front of others. In a study by Steptoe and Fidler (1987), students were reported as having higher scores on the adaptation of the Speilberger's State Anxiety Inventory when compared to orchestral musicians from prestigious orchestras around the world. Steptoe cautioned against interpreting this result in terms of a decrease in MPA as musicians moved through their careers. Rather, such a result could mean that the most anxious musicians might not have been able to sustain a career in music and therefore might have left the profession. Other studies exploring the levels of MPA in tertiary-level music students drew similar conclusions to those reported for adult professional musicians. In a study by Schroeder and Liebelt (1999) which surveyed 330 German music students between the ages of 20-23 years, results showed that 22.8% of these students suffered from high levels of MPA. Wesner et al.'s (1990) study found that 21% of their sample of 302 music students reported high levels of MPA while 16.5% reported that the level of anxiety had had a negative impact on their careers.

Unfortunately, such MPA exacerbates existing problems and creates many more. According to Riley (2012), music institutions have often overlooked how to teach students to train and programme the mind for consistent, high-level performance. Instead, Riley suggests that institutions have mostly aggravated performance anxiety and have done little to help students find ways of working around it. It is only recently that besides focusing on the development of solid technique and sound, teaching has started to go into the realms of monitoring and mental coaching.

According to Sataloff et al. (1999), when a performer makes a potentially humiliating and frightening mistake, this situation becomes less tolerable as time goes by and a behavioural feedback loop is created. From this moment onwards, the act of performance becomes the stimulus perceived as a threat, and the individual becomes more alert and sensitive. Sataloff et al. (1999) state that in anticipating mistakes, arousal heightens, which further enhances the individual's access to memories of mistakes and feelings of humiliation, thus triggering more fear and arousal. Consequently, catastrophic thoughts, physiological manifestations of anxiety, and negative imagery latch on to this spiralling process, which is often initiated at a very early stage of a musician's musical training.

Riley (2012) suggests that anxiety is a learned response and that it is the ethical responsibility of teachers not to perpetuate it and to introduce techniques that actively combat the negativity outside and inside the classroom. While it is agreed that a music institution should act as a microcosm of the real world, Riley (2012) recommends institutions to also be a safe place where students are not overwhelmed by judgment and condemnation and where negative thoughts, behaviours and physical symptoms resulting from MPA are pre-empted or corrected. Riley (2012) emphasizes the importance of teaching students to achieve balance, not only in their performance but also in their goals, self-concept and expectations. Such mental training techniques include aspects such as biofeedback, concentration and relaxation exercises, positive self-talk, positive imaging, specified performance planning and specified goal setting.

Green (1982) too suggests that there should be a shift in teaching. While Riley (2012) states that many students feel nervous even in performing in front of their teacher, Green (1982) highlights the need for tutors to move away from a dictatorial style of teaching toward the more beneficial mode of awareness instruction. This learning process involves students by encouraging them to pay attention to what they are playing and being aware of what is going on. In not being told which is the right or wrong way of doing things and not being given a series of complex steps that are easily confused and forgotten, Green (1982) believes that students can feel free from doubt, frustration, and discouragement.

Emmons et al. (1998) also suggest that since performers' top fears tend to be those of failure, rejection, discomfort and the unknown, teachers should give positive reinforcement to students' efforts because negative appraisals usually result in lower self-estimates, while positive feedback raises them. Riley (2012) goes on to say that teachers should also discuss the reasons for performing and the performance anxiety that follows with their students, so performers can clarify their personal objectives and resolve inner conflicts standing in the way of their commitment. Moreover, such discussions could bring to the surface negative thinking patterns which could be replaced by positive, alternate ones, thus giving students a more objective and less critical perception of self.

According to Emmons et al. (1998), strategies of how negative thought processes can be dealt with, how a healthy self-concept can be established and how MPA can be kept in check, include teachers adopting and enforcing a policy where students keep a daily record of thoughts related to their performance and to themselves, and developing triggers such as a teacher holding a big red stop sign when negative thoughts emerge. Eliminating negative self-judgments and reformulating them into positive self-talk would affect the students' perception of their strengths, qualities, skills and ability, and would in turn heighten their confidence, resulting in a better performance.

Paprocki (1999) also suggests goal setting as another mental process which can be taught in the classroom. By defining a mission statement and setting short and long-term goals, Paprocki (1999) suggests that students form a target towards which they can train and then gauge their progress through various checkpoints agreed upon by both teacher and student according to what they wish to accomplish together. Riley (2012) suggests that students should also be encouraged to have daily, weekly, monthly, and yearly goals so that they can feel in control and accomplish their goals. This type of mind-set would help students to quickly get over performance highs and lows and to therefore achieve a more level mental state, which is less prone to anxiety.

Imagery is another technique suggested as boosting students' levels of performance while reducing their anxiety (Caldwell, 1990). This technique is one where students are first taught to imagine exactly what they want out of their training and practice, and then they are asked to imagine themselves as being successful in performance while developing a high sense of self-belief. As Caldwell (1990) suggests, imagery cannot include just the sense of sight, but all of the other senses too: sound, taste, smell, touch and the kinesthetic sense. According to Riley (2012), the more precise the student's sensory images are, the greater the possibility of delivering a convincing performance. Besides, spending time in rigorous application of imaging ensures that anxious students spend less time in thinking negative thoughts.

Imagery can also be used to induce performers into a state of relaxation or of performing readiness by either imaging themselves in a place where they are at peace, or by reliving a previous successful performance in detail (Riley, 2012). In Stanton's (1993) study, combining positive self-talk to imagery resulted in a significant decrease in musicians' overall level of MPA. According to Riley (2012) imaging can also be used to accelerate the learning process when a student imagines performing a task successfully before actually doing it. Teaching students this mental skill could also help them inhibit bad practices and cultivate new ones which in turn could boost confidence and thereby reduce anxiety.

Paprocki (1999) also suggests starting a lesson with deep, diaphragmatic-abdominal breathing to trick the mind into a relaxed concentration and to alleviate negative MPA. A study by Su et al. (2010) examined the effects of a 10-minute relaxation breathing intervention conducted twice weekly for two months on 59 talented Taiwanese students in grades 3-6. The goal of this study was to reduce MPA in the lead-up to a music examination. The study found that this technique had some efficacy in reducing self-reported MPA as measured by the MPAI-A by Osborne and Kenny (2005). However, as Kenny (2011) states, students were not screened for their level of MPA prior to their enrolment in the trial and the pre-testing showed that as a group, levels on the MPAI-A were low. Such a study would therefore need to be replicated on a sample of students testing high on the MPAI-A at pre-test to reduce the problem of floor effects in samples that are not high in anxiety baseline.

Riley (2012) suggests engaging in stretching exercises to direct students to areas of tension in their body before beginning to play. Releasing this tension would disable certain negative tendencies while promoting the necessary mind-body connection for peak performance. In terms of physical relaxation, Paprocki (1999) mentions ‘autogenic training’, a type of biofeedback, where students are taught how to create at-will sensations of heaviness, warmth, changes in respiration, heart rate reduction, apparent warming of the solar plexus and cooling of the forehead. Another technique mentioned by Emmons et al. (1998) is that of progressive muscular relaxation where sets of muscles are repeatedly tensed and released in order to induce deep physical relaxation. Having total tension alternate with total release results in body-mind relaxation and students would develop a heightened sensitivity to the level of tension required for optimal performing. Riley (2012) also encourages teachers to recommend physical activity as it helps in managing depression and anxiety, promotes general health, enhances body awareness and improves self-esteem.

Very little is in known about whether or how physical activity can help performers cope with MPA. It is important to keep in mind, however, the possible impact on cultural norms and expectations in the classical musical field with regards to physical exercise and music performance.

1.4 PHYSICAL ACTIVITY AND EXERCISE

The link between a healthy body and a healthy mind is not a new concept for optimizing general functioning in life. The US Department of Health and Human Services (2008) reports that by engaging in physical activity, all-cause mortality is delayed. This is also the case when an individual increases physical activity by changing from a sedentary lifestyle to one that achieves recommended physical activity levels. Physical activity and exercise decrease the risk of developing coronary heart disease (CHD), stroke, type 2 diabetes and some forms of cancer such as colon and breast cancers. It also lowers blood pressure, improves other CHD biomarkers, and among other things, plays an important role in weight management. A physically active lifestyle also enhances feelings of well-being (Bartholomew et al., 2005), quality of life (Conn et al., 2009) and cognitive functioning (Kramer & Erickson, 2007), lowering the risk of cognitive decline and dementia (Larson et al., 2006). Physical activity is also associated with the prevention of, and improvement in mild to moderate depressive disorders and anxiety (Bibeau et al., 2010). It has also been found to correlate negatively with anxiety and self-criticism, and to help in developing self-enhancement (Kayani et al., 2020; Kayani et al., 2021).

The pervasiveness of mental health disturbances presents a significant social problem. Mental disorders occur in all regions and cultures of the world with the most prevalent being depression and anxiety which are estimated to affect nearly one in ten (676 million) people on the planet (World Health Statistics, 2016). Although as Petruzzello et al. (1991) state there are a number of psychotherapeutic interventions such as hypnosis, meditation, relaxation and biofeedback, which exist to alleviate depression and anxiety, substantial interest has focused on the benefits of physical activity on mental health. Many health professionals believe that exercise can prevent the onset of emotional problems, as well as serve as an effective treatment modality once these problems develop (Morgan & Goldston, 2013). This, along with the fact that a number of adverse effects can occur when taking psychotropic drugs such as potential withdrawal symptoms, has led to a numerous amount of research investigating the link between physical exercise and mental health (Petruzzello et al., 1991).

To measure physical activity in the general population literature has made use of surveys. Surveys have also been used often in music-related research investigating pre-performance routines while examining other topics such as music performance anxiety. Surveys have also been the method of choice for literature concerning self-reports of physical activity and exercise in musicians. Such literature has most commonly used the International Physical Activity Questionnaire – Short Form (IPAQ-SF) (Craig et al., 2003). In a study that aimed to investigate a set of potential risk factors for playing-related musculoskeletal disorders (PRMDs) and the relationship between sedentary behaviour and PRMDs, for example, Matei and Ginsborg (2020) used IPAQ-SF in a cross-sectional questionnaire survey as it was deemed as having reasonable measurement characteristics for physical activity. The survey included 111 undergraduate music students who answered questions relating to how much time they spent in vigorous and moderate exercise, as well as the time they spent walking during the previous 7 days. As is required for IPAQ-SF, responses were converted to minutes, all variables representing vigorous and moderate physical activity and walking exceeding 180 minutes (3 hours) were recoded as 180 minutes, while variables representing vigorous and moderate physical activity and walking exceeding 1260 minutes (21 hours) were recoded as 1260 minutes. Metabolic equivalent of energy expenditure (MET)-minutes/week, MET-minutes/week scores, and total sum of MET-minutes/week were computed according to the instructions for using IPAQ-SF.

IPAQ-SF was also used in a study by Araujo et al. (2020) to explore associations between objective fitness levels and self-reported engagement in physical activity in a study aimed to profile the physical fitness of higher education music students. The researchers' reasons for using IPAQ-SF were its popularity and it being the recommended choice in longitudinal and monitoring studies. However, Araujo et al. also acknowledged the drawbacks of IPAQ-SF as it might be subject to bias and over-rating as happens in self-report measures. They also pointed out that IPAQ should align better with the WHO recommendations and that it should apply stricter requirements at moderate level of activity by, for example, increasing the threshold for 1200 MET-min per week. They argued that this would be important in distinguishing between participants not involved in particular physical training.

As the above-mentioned studies both concern physical fitness in undergraduate music students, this thesis fills the gap in the literature by examining perceptions of physical fitness in professional musicians (Study 3, Chapter 6).

1.4.1 Chronic Exercise and its Effect on Anxiety

Research on the effects of physical exercise and anxiety has generally focused more on chronic than on acute exercise. Chronic exercise represents multiple bouts of aerobic exercise over a period of time, performed regularly at a known intensity and duration, which is aimed at improving cardiovascular fitness (Wasley, 2006).

Most of the early studies on chronic exercise and anxiety are either correlational or cross-sectional (Morgan, 1970), or lack adequate motivation control groups (Cureton, 1963), limiting conclusions by the failure to manipulate exercise. More recent reviews, such as those by Dishman (1982), and Phelps (1987), which attempt to synthesize the literature related to the anxiolytic effects of exercise, are of a narrative and a qualitative nature. As Petruzzello et al. (1991) state, results in such studies do not accurately reflect the whole area under review, and show an inability to quantify the magnitude of the effect in question. In an attempt to provide a solution to these problems, Petruzzello et al. (1991) provided three separate meta-analyses to quantitatively review 104 studies carried out between 1960 and 1989 which concerned the exercise-anxiety literature for trait anxiety, state anxiety and psychophysiological correlates of anxiety.

The results of these meta-analyses supported the claim made in earlier research (El-Naggar, 1986; Steptoe & Cox, 1988) that exercise was associated with reductions in anxiety. However, this was only as far as aerobic exercise was concerned. More specifically, results showed that chronic exercise (not acute exercise) was associated with reductions in self-reported trait anxiety. This was due to the reported change in trait anxiety using a longitudinal design where comparisons between acute and chronic exercise could not be made. For self-reported state anxiety, results showed that both chronic and acute exercise were associated with a reduction in anxiety. For psychophysiological correlates, studies only examined chronic exercise and found it to be associated with a reduction in anxiety.

Petruzzello et al. (1991) reported that the effects of exercise on anxiety were generally found to be independent of descriptive characteristics and of subject, such as age and health status. The importance of random assignment was highlighted in achieving larger effects in trait anxiety when compared to intact groups. Training programs were also found as needing to exceed 10 weeks before significant changes in trait anxiety could occur. For state anxiety, exercise was found to have similar effects to other known anxiety-reducing treatments such as relaxation. For psychophysiological correlates, cardiovascular measures of anxiety such as heart rate and systolic and diastolic blood pressure were found to yield significantly smaller effects than other measures such as electromyography (EMG) and EEG.

Some outcomes associated with the anxiety reducing effects of physical exercise in the literature have focused on neurophysiological factors. Iwamoto and Kaufman's (1987) study showed neurophysiological evidence that afferent impulses transmitted from the working muscles were received by a number of brainstem collateral neurons. This resulted in an increased stimulation of the ascending reticular activating system. Morgan et al. (1980) showed indirect support for this in reporting an increase in state anxiety following the initiation of exercise. Bonvallet and Bloch (1961) pointed out, however, that excitation of the cortex may have reached a point at which an inhibitory mechanism was stimulated in the bulbar region of the brainstem. This stimulation could have resulted in an arresting influence on the reticular formation so that there was a reduction in the somatic afferent stimulation to the cortex. As such, the excitation of the cortex might have been decreased, with this dampening effect lasting well beyond the initiating stimulus promoting a prolonged post-stimulus effect.

Support for this visceral-afferent feedback can be seen in the various EEG studies of cortical activation after various forms of aerobic exercise. Boutcher and Landers' (1988) study, for example, interpreted the increase in EEG alpha activity after exercise as an indication of a relaxation response or reduced anxiety. This was based on the traditional belief that the presence of EEG alpha reflected a decrease in cortical activation (Petruzzello et al., 1991). According to Wiese et al. (1983), the increased alpha power following exercise could contribute to an alternate state of consciousness. According to Wiese et al. (1983) this could also have helped to explain the psychological benefits that were reported with regular exercise such as a reduction in anxiety.

The above EEG studies are limited for various reasons, but also as Petruzzello et al. (1991) state, because they have failed to statistically analyze EEG pre and post differences. Despite the paucity of research in this area, the visceral-afferent feedback hypothesis offers an interesting take on the effects of changes in the cardiovascular system and its somatic afferents upon the CNS through muscular and autonomic activity during exercise.

Many studies have focused on the effects of chronic exercise on psychological well-being comparing it to inactive control groups (Taylor & Wasley, 2004). In a study by Biddle et al. (2000), chronic exercise was associated with increases in positive mood and affect, such as increases in vigour and activation. It was also associated with reductions in negative mood, such as a decrease in tension and depression. Mutrie (2000) suggests that chronic exercise reduces depression, while Fox (2000) reviewed considerable evidence which shows that physical self-perceptions and physical self-concept are improved through chronic exercise. Boutcher (2000) reported that the speed and capacity to process information was enhanced through exercise. Taylor (2003) also supported Petruzzello et al.'s (1991) conclusion that chronic exercise reduced trait anxiety.

One possible explanation for the anxiety reducing effects of chronic exercise is that such exercise improves self-confidence and self-esteem (Taylor & Wasley, 2004). Fox (1997) suggests a hierarchical model of physical perceptions where the more negative labels individuals have, the lower their self-perceptions across different domains such as the academic, musical, physical, and social, are. According to this model, if there is only one domain in which individuals feel good about themselves, their self-esteem would be relatively low. Self-esteem has also been negatively linked to neuroticism where the lower the self-esteem, the higher the neuroticism of the individual (Fox, 1997). Taking on regular exercise, on the other hand, provides individuals such as musicians with the opportunity to experience mastery, not only in music but also in physical exercise, therefore enhancing their self-esteem. Experiencing mastery in doing regular exercise is easy as exercising does not only lead to improvements in the time taken to perform a particular exercise, but it also reduces negative physical symptoms such as breathlessness and fatigue (Taylor & Wasley, 2004).

Another explanation for the reduction of anxiety through regular exercise is through the distraction hypothesis by Bahrke and Morgan (1978). This hypothesis maintains that being distracted from stressful stimuli is the cause for the anxiety reduction seen with exercise. Taylor and Wasley (2004) suggest that performing exercise at an intensity which forces the mind to think about the physical symptoms of the activity itself prevents the mind from ruminating on ongoing worries. Petruzzello et al. (1991) suggest that changes in anxiety occurring through exercise may also occur with distraction therapies such as quiet rest, meditation and relaxation. However, the results of their meta-analyses showed that while for state anxiety exercise and cognitively-based distraction therapies were equally effective in reducing anxiety, exercise had superior anxiolytic effects on trait anxiety when compared to cognitive strategies. This fits in with Dienstbier's (1989) physiological toughness hypothesis which suggests that while cognitively-based anxiety reduction strategies provide only a short-term solution to anxiety reduction, aerobic exercise leads to a long-term adaptation.

1.4.2 Chronic Exercise and Its Effects on Music Performance

The first attempt at introducing a taxonomy of stress was made by Hans Selye (1936) who defined stress as a non-specific endocrine response. Current research explains stress through the modulation of the autonomic nervous system (ANS) which results from physical, environmental, or other psychosocial stressors, where both the sympathetic (SNS) and parasympathetic nervous system (PNS) are involved in the regulation of functions which include blood pressure (BP), heart rhythms and respiration (Billman, 2011).

Research in the effects of stress on musical performance has been considerable (Abel & Larkin, 1991; Valentine et al., 1995). This is partly because musicians are known to be affected by general stresses related to having to perform under conditions of high adrenaline, flow, fatigue, anxiety, social pressure and also financial insecurity (Lehrer et al., 1990). The International Conference of Symphony and Opera Musicians (ICSOM) National US survey distributed to 48 orchestras reported that 24% of musicians frequently suffered stage fright, defined in this study as the most severe form of performance anxiety; 13% experienced acute anxiety and 17% experienced depression (Lockwood, 1989). In another study by James (1998), in a survey of 56 orchestras, 70% of musicians reported experiencing anxiety that was severe enough to interfere with performance; 16% experienced this anxiety more than once a week. In Ackermann et al.'s (2014) study surveying eight premier Australian orchestras, which was also reported in a study by Kenny (2011), 44.8% of musicians reported significantly increased muscle tension prior to or during performance; 41.2% reported significantly increased heart rate while 37.3% reported that their level of worry and nervousness about their performance interfered with their concentration and focus.

The majority of stress research into music performance, however, has focused primarily on the psychological construct of MPA through the use of questionnaires, while neglecting the objective assessment of corresponding physiological components (Chanwimalueang et al., 2017). One exception has been Craske and Craig's (1984) which studied 40 musicians in both private and public performance contexts. State anxiety was assessed using a questionnaire before each performance and heart rate was (HR) extracted as a measure of autonomous body response to and after the first note played. Results showed that the highest physiological arousal was in the public performance scenario. The average HR prior to each performance was reported to be significantly higher than the average HR during the corresponding performance. Abel and Larkin's 1990 study is similar to Craske and Craig's 1984 study investigating 22 musicians performing in front of a panel of judges. Results showed elevations in the measured HR and state anxiety from baseline to the pre-performance period, with a peak in physiological reactivity detected just before participants stepped on stage. However, HR was not measured during performance, and this prevented direct comparison with the pre-performance period (Chanwimalueang et al., 2017). While other research into physiological stress in musicians has examined cardiovascular reactivity pre-, during, and post-performance, studies like that of Yoshie et al. (2009) have mainly relied on HR rather than the more informative heart rate variability (HRV).

The literature concerning the physiological benefits of chronic exercise on performance specialties is scant. Wasley's (2006) study examining the effects of regular sessions of exercise on the psychological and physiological indices of stress on musicians is a rare find. Results showed that when comparing a group of conservatory students who underwent a weekly 1-hour group session at a local gym for 16 weeks (and expected to do at least 3-5 days of 30 minutes of moderate intensity exercise), to another group assigned to the same contact hours in Alexander technique, chronic exercise reduced absolute HR response to music performance but not significantly so. Chronic exercise also did not significantly impact HRV before music performance. However, chronic exercise was found to reduce HR response during music performance when compared to the Alexander technique group. State anxiety responses to music performance were also found unaltered after chronic exercise. These results on whether physical exercise impacts a real-life stressor like music performance were inconclusive. Wasley et al. (2011) suggests that these inconclusive results could be attributed to a number of factors such as the fact that the intensity of the exercise intervention might not have been sufficient to generate alterations in state anxiety. He also suggests that results may have reflected the fact that the Alexander technique group did not represent a truly passive equal contact control group but rather impacted individuals' responses to stress in a different way to chronic exercise.

1.4.3 Acute Exercise and Its Effects on Music Performance

As shown in section 1.3.1, research has found chronic exercise to have a positive impact on arousal, anxiety and dimensions of mood and affect. Acute exercise and its impact on specific emotions and moods is, however, less understood. Bartholomew (2000) suggests that the impact of acute exercise on stress reactivity might be explained through the mastery hypothesis, in combination with the conception of stress appraisal given by Lazarus and Folkman (1984). Lazarus and Folkman (1984) suggest that the experience of stress is based on the primary appraisal of the faced threat, and on the second appraisal of one's ability to meet the demands of that challenge. Although it is unlikely that exercise impacts on the primary appraisal to threat, it may increase the perception that an individual can meet the demands of a subsequent challenge. The effort and determination needed to be successful at completing acute exercise, therefore, could give rise to a sense of accomplishment that might generalize to subsequent challenges. This is most likely to occur after a high dose of exercise since positive self-perceptions would be maximized with the completion of a relatively challenging task (Bartholomew, 2000).

Bartholomew's (2000) study assessing the effect of performance feedback on stress reactivity after maximal exercise, consisted of 40 competitive athletes completing a maximal exercise test. Results showed that maximal exercise reduced relative reactivity to stress. The mastery hypothesis was also tested by assessing the impact of manipulated performance feedback on post-exercise stress reactivity. Results supported the mastery hypothesis. High-performance feedback participants responded to the speech task with a smaller increase in mean arterial pressure than the low-performance feedback participants. The participants who received low-performance feedback, in fact, responded no differently than the non-exercising control group. The presence of low-performance feedback, therefore, was sufficient to negate any benefit for stress reactivity that was provided by an acute bout of maximal aerobic exercise. On the other hand, high-performance feedback was insufficient to further reduce mean arterial pressure relative to accurate feedback participants. No differences in reactivity were found between these groups. These results, however, cannot be generalized as tests were carried on competitive athletes not on recreational ones or sedentary individuals.

Bartholomew's (2000) results support Hobson and Rejeski's (1993) study which tested 80 low to moderately trained women in completing maximal aerobic exercise for 10, 25 or 40 minutes. Results showed that only the women who had completed 40 minutes of exercise showed lower mean arterial pressure reactivity when compared to attentional controls. This same result was obtained in Rejeski et al.'s (1992) study of untrained women and in Steptoe et al.'s (1993) study of sedentary males. Bartholomew (2000) concludes that the results from these studies point to the fact that individuals' who completed a relatively high dose of aerobic exercise would experience lower reactivity to subsequent psychological stress.

One research concerning the effects of acute exercise on physiological and psychological responses to music performance is Wasley et al.'s (2011) study. In contrast to the studies by Hobson and Rejeski (1993), and Bartholomew (2000), however, Wasley et al.'s (2011) study tested participants completing sub-maximal, not maximal, acute exercise. In this study, 12 musicians were asked to either complete an acute exercise session (EX) or no exercise session (NEX) prior to a recovery phase before performing a musical piece for competition with a prize. These performances were recorded using tape and video to enhance the psychosocial aspect of the real-life stressor. Afterwards, participants listened to both of their performances and selected the one they thought they performed best in. The performances were then passed on to a judge for adjudication.

The results of this study showed that while anticipation of the music performance increased HR following EX and NEX, there was no difference between conditions in HR response once post-exercise HR had been accounted for. Music performance in this study did not produce significantly elevated BP responses after familiarization of the protocol. Acute exercise did not alter BP response to music performance. Results also showed that even though performance resulted in a significantly elevated state anxiety, the effects were not influenced by a prior bout of exercise. In addition, even though state anxiety was lower throughout the EX condition, it was not significantly different from the NEX condition. After reviewing their performances via a tape cassette recording, seven of the participants chose the performance in the EX condition while five chose the one in the NEX condition.

Wasley et al.'s (2011) study concerning the effects of chronic and acute exercise on MPA showed different results to the other earlier and similar studies examining the effects of chronic and acute exercise on HR, HRV, trait and state anxiety. This might be because Wasley et al. (2011) used a real-life stressor (RLS) such as music performance, as opposed to the majority of studies that used laboratory-based stressors (LBS). Consequently, the exploration of RLS may have revealed different effects when compared to those observed in LBS. However, Wasley et al.'s (2011) study is the only one which tested for the effects of physical exercise on music performance and therefore these results cannot be generalized. The authors also suggest that this study could have been limited by the lack of practice of the exercise bout prior to the pre-performance. While the design allowed for a warm-up and a familiarization session, it did not encourage individuals to experiment with exercise before performance. In other fields such as sport, it is generally recommended to incorporate new interventions during practice before including them in performance routines. This, in fact, might have changed the outlook of the musicians on the effect of exercise on their musical performance.

It is also important to keep in mind that Wasley et al.'s (2011) study concerning acute exercise employed moderate, rather than maximal exercise. When compared to previous studies, this factor might have led to the equivocal result of no difference between the NEX and EX conditions in HR response. Keeping in mind Petruzzello et al.'s (1991) suggestion that research should establish the minimum time duration for achieving a reduction of anxiety, it is to be noted that the duration of exercise in Wasley et al. (2006) was of only 20 minutes while bouts of exercise in previous studies were between 30 to 40 minutes. Furthermore, the small sample size in this study might have also contributed to the disparity in results with previous studies having had bigger sample sizes.

Finally, Taylor and Wasley (2004) suggest that before musicians employ acute exercise prior to an actual performance, they should first experiment with it, as the lasting effect of post-exercise hypotension varies according to the individual. The participants in Wasley's (2006) study did, in fact, vary both in levels of fitness and in gender. Their recuperation time was therefore bound to be different as recuperation depends on one's fitness, personal preferences, as well as emotions and moods attached to a particular performance.

Apart from the above-mentioned research by Araujo et al. (2020), and Matei and Ginsborg (2020), no other studies exist that investigate physical activity and exercise in musicians. More specifically, no research exists which investigates physical activity and exercise in professional musicians. There is also no research which explores physical activity and exercise as a potential pre-performance routine for musicians. Chapter 6 of this thesis fills this gap in the literature.

1.5 RATIONALE FOR PRESENT RESEARCH

With the limitations of the current literature in mind, the aim of the present thesis can be summarized in the following question:

How do professional musicians prepare in order to optimize performance?

Within this overarching question, the following areas of inquiry were also identified:

RQ1: What, if any, pre-performance routines do professional musicians engage in prior to performance and does this change during the pre-performance period?

RQ2: What are the reasons behind musicians' engagement and change in pre-performance routines?

RQ3: How do professional musicians perceive their pre-performance routines to have an effect on performance? Is this reflected in their recollections of optimal performances as compared with their worst?

RQ4: What are professional musicians' perceptions of their levels of physical fitness?

RQ5: What physical activity and exercise do professional musicians engage in, and what are the reasons for this?

RQ6: What are the perceived functions of physical activity and exercise for wellbeing and on performance?

In order to investigate these questions, the following studies were undertaken.

Study 1 (Reported in Chapter 3)

This study explored RQ1 and RQ2. To answer these research questions, an online survey was created and sent to English-speaking international professional musicians and students. The aim of this survey was to recruit as broad a spectrum of musicians as possible. Therefore, the survey entitled *Pre-performance Routines* was sent out in the UK and internationally to English-speaking music institutions and orchestral bodies and also to music organisations within countries with a good level of English proficiency. The survey was also sent out to individuals who are well-known artists and to others in my own professional network.

Study 2 (Reported in Chapter 4 and 5)

Study 2 was shaped by the results in Study 1. The aim of this study was to seek greater understanding of the pre-performance routines adopted by professional orchestral musicians. Study 2 also sought to better understand the complexities behind the functions pre-performance routines are perceived as having on performance and to further investigate surprising results from Study 1. Therefore, to address RQ3 semi-structured interviews were conducted with 12 professional orchestral musicians (5 females and 7 males) recruited from orchestras in English-speaking countries. Since the greatest percentage of respondents in the first study belonged to the string section of the orchestra, participants for this investigation were restricted to the four string instrument groups: violinists, violists, cellos, and double bassists. An equal number of participants was chosen for all instrument groups. All interviews were conducted online as the first UK COVID-19 lockdown occurred.

Study 3 (Reported in Chapter 6)

Study 3 was created to explore the phenomenon of physical activity and exercise which emerged in Study 2. Study 3 was therefore built on data analysis from Study 2 to generalize findings. On this basis, Study 3 sought to explore the perceptions of professional musicians on their levels of physical fitness. As literature on physical fitness and musicians is scant, Study 3 also aimed to explore what physical activity and exercise professional musicians engage in and what the reasons behind this engagement are. Study 3 also explored the perceived functions of physical exercise on performance and as the study was conducted during the last UK Covid-19 lockdown, it also sought to shed light on the effects of physical activity and exercise on professional musicians' general health and wellbeing. To answer RQ4, RQ5, and RQ6, Study 3 involved a survey entitled *Fit Musician* open to classical professional and postgraduate instrumental musicians.

1.6 OUTLINE OF THE PRESENT THESIS

This thesis is based on three studies and is divided into 7 chapters.

Chapter 1 reviews literature concerning pre-performance routines in sport, across other performance domains and in music. It then addresses the literature concerning music performance anxiety and pre-performance routines and strategies which have been investigated to alleviate it and enhance performance. The chapter then moves into the literature concerning physical activity and exercise in professional musicians and to the literature investigating physical activity and exercise and music performance through biofeedback. It then provides the rational for research as well as the research questions that emerge from the literature, the methods used to address the research questions. Chapter 2 focuses on the methodological approaches employed in the thesis.

Chapter 3 introduces Study 1 which is a survey-study investigating pre-performance routines in professional musicians. It also explores whether these routines change prior to performance, and it investigates the reasons for musicians' engagement with these routines.

Study 2 is built on findings in Study 1 and is divided into Chapters 4 and 5. This study is an interview study and explores in greater detail the performance strategies and pre-performance routines adopted by professional musicians as well as the functions these are perceived as having. While Chapter 4 focuses on performance strategies adopted on the day of performance, Chapter 5 focuses on performance strategies adopted on the day of either optimal or worst performance.

Chapter 6 concerns the third and last study. Once again informed by the results in Study 2, Study 3 presents a survey-study investigating physical activity and exercise in professional musicians, the reasons behind such exercise, and the impact physical activity and exercise is perceived as having on professional musicians' wellbeing and performance.

This thesis ends with Chapter 7 which focuses on how the research questions have been answered as well as the strengths and limitations of this research. It also suggests directions for potential applications of the findings for training and practice, and for future research.

CHAPTER 2

Methodological Approaches

2.1 INTRODUCTION

This chapter reviews the methods employed in this thesis detailing the epistemological and multistrategy approach, and the design of this research.

2.2 METHODS EMPLOYED IN THE PRESENT THESIS

2.2.1 Pragmatism as the epistemological approach

The approach taken to research investigation in this thesis was that of Pragmatism. The philosophy behind this comes in many forms, but for the most part, it arises out of intersectionality of actions, situations and consequences, rather than that of singular antecedent conditions (Creswell & Creswell, 2017). Pragmatism moves away from the notion that research must be rooted in one particular approach in generating knowledge. This means that in the pragmatic worldview, the focus is on the research problem and how best to understand it, considering all available approaches to derive knowledge about the problem (Rossman & Wilson, 1985). In using pragmatism, therefore, researchers are open to draw from both quantitative and qualitative assumptions, without restriction to a single system or approach. In this way, researchers are open to choose whatever method, technique and procedure they think is best for the needs and purposes of their research and is practicable (Creswell & Creswell, 2017).

According to Morgan (2007), the pragmatic approach should align with aspects of both social constructivism and post-positivism through the processes of abductive reasoning, intersubjectivity, and transferability. The process of abductive reasoning combines bottom-up and top-down approaches by generating and testing theories, while intersubjectivity recognizes that although the social world is experienced subjectively, it can also be viewed objectively. The process of transferability focuses on the extent by which findings can be applied in different domains rather on how generalizable or specific they are as what happens in post-positivism and constructionism respectively.

The most appropriate approach to answer the overarching research question of “how do professional musicians prepare in order to optimize their performance?” was the pragmatic approach. This is because the research question required the following: what pre-performance routines musicians adopt prior to performance; what the perceived function of these pre-performance routines is on performance. To generate the first kind of knowledge, the top-down approach, the more objective approach, was needed (such as in providing a prepared list of possible pre-performance routines for response to), while to generate the second, the subjective bottom-up approach was best (such exploring musicians' free form responses to the impact of their routines). Therefore, this thesis first gathered objective data on pre-performance routines adopted by professional musicians during their pre-performance period (Chapter 3). Then, recognizing that each musician had a different experience of optimal performance and of pre-performance routines, it embraced the intersubjective approach by exploring the complexities of performers, pre-performance routines and optimal performances (Chapter 4 and 5). Finally, the bottom-up approach was used to generate findings that could be then used to test further in a wider population (Chapter 6). These findings are then presented to other professional musicians, students and teachers to consider transferring knowledge into their own practices.

2.2.2 Multistrategy research

Multistrategy research employs the combination of quantitative and qualitative approaches. The multistrategy approach is also referred to as mixed-methods elsewhere in the literature where the focus is on the combination of a single qualitative and quantitative approach rather than on the combination of methodological approaches (Williamon et al. 2021). In fact, over the years, multistrategy research has gained popularity because research methodology continues to progress, and combining the strengths of both qualitative and quantitative approaches in multistrategy research is another step forward. Moreover, more insight is gained from the combination of qualitative and quantitative research than either form in itself (Creswell & Creswell, 2017).

According to Johnson and Onwuegbuzie (2004), multistrategy research addresses the research question and solves a problem, or explores a phenomenon from different perspectives by either adding numbers to add further context to pictures or words, or adding pictures or words to add further meaning to numbers. Multistrategy research is framed within the pragmatic epistemology and is based on the belief that knowledge generated in different ways can inform different parts of the same investigation. It is also believed that the combination of qualitative and quantitative approaches aimed to either address "real world" questions or solve “real-world” problems, are either weighted equally or focus more on one of the approaches which is supported by the other. In attempting to produce comprehensive evidence, multistrategy research is concerned with employing a range of methods to provide the strongest possible evidence.

Multistrategy research has two designs: sequential and concurrent. The sequential design involves the qualitative and the quantitative stages of research occurring sequentially. Creswell et al. (2003) identify three sequential designs: explanatory, exploratory and transformative. The explanatory sequential design is characterized by a first phase of research where the collection and analysis of data is quantitative in nature, and by a second phase which builds on the results of the first stage and collects and analyses data qualitatively. In this design, weight is given to the quantitative data while the mixing of data occurs when quantitative results inform the secondary qualitative data collection. The purpose of this design is to explain quantitative findings through follow-up qualitative data especially when the first stage of research reveals unexpected results. The strengths of this design lie in its straightforward nature and in the ease with which it can be implemented. Consequently, it is also straightforward to describe and report. As with all sequential designs, the explanatory strategy is time consuming in that data is collected in two separate phases.

The sequential exploratory design is the inverse of the explanatory design. The first stage of research comprises the collection and analysis of qualitative data which is then followed by data collection and analysis of quantitative data in the second phase. Weight is given to the qualitative data and data are mixed when the quantitative phase is built on the results of the qualitative data analysis. While the sequential explanatory approach is better suited to explain and interpret relationships, the exploratory approach explores a phenomenon. This design is useful when exploring a phenomenon and wanting to expand on the qualitative findings. It is also useful when a researcher is building a new instrument. Morgan (1998) suggests that the sequential exploratory design is appropriate when a researcher wants to test elements of an emergent theory resulting from the first phase and then generalizing the qualitative findings in a second instance. This design is as straightforward and easy to implement as the explanatory strategy and it is as time consuming. In this design it is important to be able to take decisions on which findings from the initial phase will be focused on for the subsequent phase.

The sequential transformative strategy on the other hand, has a theoretical lens which overlays the two distinct data collection phases. In this design, the initial phase can either be qualitative or quantitative and is then followed by a second phase which is quantitative if the first phase is qualitative, or qualitative if the first phase is quantitative. The weight is given to either method or is distributed evenly. The mixing of data is the same as for the other sequential designs. The purpose of this design is to serve the theoretical perspective of the researcher, be it in giving voice to different perspectives or to better understand a phenomenon or process. This design shares all the strengths and weaknesses of the other subsequent designs. However, literature on this approach is scarce and so there is little guidance on how to use this transformative vision to help the methods.

Creswell et al. (2003) also identify three concurrent designs, the first of which is the concurrent triangulation strategy. In this design, the collection of qualitative and quantitative data happens concurrently and both databases are compared to determine differences, convergences and combination between the two. The weight is ideally equal between the two methods, and the mixing of data happens when merging, integrating or comparing data. This design allows for a shorter data collection time period than the sequential designs and it can also result in substantiated and well-validated findings. Among the limitations of this design is that expertise is needed in studying a phenomenon using two separate methods especially when trying to resolve discrepancies arising from comparing results.

The second concurrent design is the concurrent embedded strategy which like the triangulation strategy has only one data collection phase during which both quantitative and qualitative data are collected concurrently. The difference between the two is that in the embedded strategy the primary method guides the project while the secondary method is embedded within the primary method. This means that the secondary method is given less priority. It may also mean that this method may either address a different question or aims to provide information at a different level of analysis than the first. The mixing of data happens when integrating information and comparing one data source to another. The purpose of this design is to gain broader perspectives through using different methods. The concurrent embedded strategy also allows for the advantages of both qualitative and quantitative data, gaining perspective from the different types of data and from different levels within the study.

Finally, the concurrent transformative strategy is an approach which like the sequential transformative model is guided by the researcher's use of a specific theoretical perspective and the simultaneous collection of both qualitative and quantitative data. The design may take on the features of the concurrent triangulation or embedded approach thus adopting the strengths and weaknesses of these approaches. The mixing of data occurs through merging, connecting and embedding data.

To answer the present overarching research question, it was deemed appropriate to collect and analyze data in three distinct phases by employing and combining the sequential explanatory design with the sequential exploratory design. The sequential explanatory strategy was used to explain and interpret the quantitative results on pre-performance routines and professional musicians by collecting and analysing follow-up qualitative data on the topic. This was especially useful when quantitative data generated results which were difficult to interpret. The sequential exploratory design was then used to collect and analyze quantitative data emerging on the results of the second qualitative phase. This was especially useful to explore a phenomenon which emerged from qualitative data analysis. This sequential exploratory design further helped determine the distribution of the emerging phenomenon within professional musicians.

These strategies allowed for a straightforward design which was also easy to implement due to its clear, separate stages. The weakness of employing a three-phase sequential design was the length of time needed for data collection especially because all three phases were given equal weighting.

2.3 DATA COLLECTION AND ANALYSIS

Sections 2.3.1 and 2.3.2 detail the reasons for the use of surveys and semi-structured interviews. Section 2.3.3 focuses on the characteristics of interpretative phenomenological analysis, the reasons why this was chosen as a form of data collection, and analysis of data.

2.3.1 Surveys

According to Babbie (1990), surveys provide a numeric description of a population's trends, attitudes and opinions. Surveys can reach participants in disparate locations, are economical in design and give a rapid turnaround in data collection. They can be cross-sectional, capturing participants' responses at a particular point in time, or longitudinal, obtaining data from a sample of participants on two or more occasions to explore long-term relationships and trends between data gathered at different points. These characteristics are what informed the surveys in Study 1 and Study 3 of this thesis. The survey *Pre-performance Routines* in Study 1 was a cross-sectional survey capturing the responses of professional musicians aimed at generalizing responses from a sample of professional musicians to make inferences about their routines prior to performance and their perceptions of these routines on performance. Similarly, the *Fit Musician* survey in Study 3 captured the responses of professional musicians on their perceived level of physical fitness, type of physical activity and exercise, and perceived function of physical activity and exercise on performance and wellbeing, and sought to generalize responses. An example of a cross-sectional survey in the music domain can be seen in Kenny and Ackermann's (2015) investigation into pain, depression and anxiety in professional orchestral musicians.

As Williamon et al. (2021) state, surveys can be constructed in a variety of ways, depending on the type of data to be collected and the type of questions asked. Questions can collect both quantitative and qualitative data through closed or open responses as in the case of surveys conducted for this thesis. The literature also suggests that items within a survey need to be validated to ensure the accuracy and consistency of the data resulting from the construct under investigation (Boynton, 2004; Creswell & Creswell, 2017). These validated questionnaires are developed by researchers for the purposes of a particular study or drawn from published reports of previous research (Williamon et al., 2021). Examples of validated questionnaires in music research include those that measure music performance anxiety (Kenny et al., 2004) and self-efficacy (Ritchie & Williamon, 2011).

In this thesis, to ensure the validity of a set of items addressing what, if any, pre-performance routines professional musicians adopt prior to performance (RQ1, Study 1, Chapter 3); musicians' perceptions of levels of physical fitness (RQ4, Study 3, Chapter 6); and musicians' wellbeing (RQ6, Study 3, Chapter 6), the following standardised questionnaires were used: Musicians Pre-Performance Survey (MPPS; Steptoe et al., 1995), the International Physical Activity Questionnaire – Short Form (Craig et al., 2003), Mental Health Continuum Short Form 14-item scale (Keyes, 2002, 2005), the Centre for Epidemiologic Studies Depression (CES-D) Short Form 8-item scale (Karim et al., 2015), the Social Connectedness Revised 15-item scale (Lee et al., 2008), the UCLA Three-Item Loneliness Scale (Hughes et al., 2004, adapted from the Revised UCLA Loneliness Scale, Russell et al., 1980). The inclusion of these ad hoc questionnaires also allowed for comparisons to be drawn between the results of this thesis and those from previous research.

The literature also suggests that if there is no relevant validated questionnaire to measure a particular construct, a questionnaire needs to be developed (Boynton, 2004; Creswell & Creswell, 2017; Williamon et al., 2021). Since no questionnaire exists in the literature on the pre-performance period or on the perceived functions of pre-performance routines on music performance, the *Pre-performance Routines* survey in this thesis included newly developed questions to investigate these constructs and address RQ1 (Study 1, Chapter 3). New questions were also developed for the survey *Fit Musician* to investigate what physical activity and exercise professional musicians engaged in and what the reasons behind this engagement were (RQ5, Study 3, Chapter 6), as well as to explore the perceived function physical activity and exercise had on performance (RQ6, Study3, Chapter 6). To ensure validity and reliability of these items, they were piloted on a sample of professional musicians to make sure the items provided the necessary data. Statistical tests were also run to check whether the type of data collected was appropriate for the tests needing to be run.

Both of these surveys were online surveys. Online surveys have the advantage of reaching a larger number of people than paper-based options regardless of their geographical location (Boyer et al., 2001). Participants can also complete online surveys whenever and wherever it is convenient (Williamon et al., 2021). Creating these surveys online enabled me to make use of survey platforms, allowing the use of digital tools such as survey logic to direct participants to the next set of questions depending on the answer given to previous ones. These survey platforms (Surveymonkey for *Pre-performance Routines* and Qualtrics for *Fit Musician*) also allowed marking items as mandatory, disallowing participants to skip and proceed till the necessary questions are answered, thus minimizing future problems associated with missing data. Using online surveys also allowed me to easily export electronic data collection to Excel spreadsheets and Jamovi, the analysis software used for quantitative data analysis in this thesis (see Chapter 3 and 6).

2.3.2 Semi-structured Interviews

The remaining study in this thesis, Study 2, is an interview study. An interview is a conversation between the interviewer and one or more participants which follows a pre-set number of topics but which allows for respondent elaboration. Interviews allow participants to explain aspects of their lives in their own words while the researcher collects data on participants' attitudes, perceptions and experiences. According to Wellington (2000) interviews are useful to elicit thought processes and feelings which would otherwise be difficult to observe. They are also useful when the research question demands detailed and individual understandings from a specific group of people or individual. Moreover, interviews are especially appropriate when little is known about a research topic as they provide a way of gathering preliminary knowledge through listening to participants talk about their practices and experiences.

RQ3 in Study 2 (Chapter 4 and 5) exploring professional musicians' perceived effects of pre-performance routines on performance is a topic on which there is little or no literature. It was therefore deemed appropriate that for the purpose of Study 2 interviews were the ideal method of data collection as through listening to participants it would be possible able to gather preliminary information about the topic. By considering participants as experts of their experiences on performance, as interviewer, I was able to take a back seat and let participants take me through their thought processes. This was particularly important as during interviews I noticed that most professional musicians do not consciously give much thought to what pre-performance routines they engage in prior to performance. Therefore, hearing them think back on their routines and trying to make sense of these experiences, putting their unconscious feelings and thoughts into words allowed me to tap into information which would have otherwise been difficult to get to. In the same way that the interviews in Study 2 helped provide detailed, individual understanding to findings in the *Pre-Performance Routines* survey, findings in Study 2 were used to as a foundation for *Fit Musician* (Study 3).

The type of interview used for Study 2 was the semi-structured interview which, according to Williamon et al. (2021) is the most common type of interview in music research (Lamont et al., 2012; Dingle et al., 2013). Semi-structured interviews are interviews that have been pre-planned, but also allow for a degree of spontaneity during interview. This interview schedule provides an outline of the broad topics and specific questions relating to these topics and is prepared prior to conducting interviews. Participants are asked all the questions in the interview schedule, but the researcher asks questions according to the natural flow of the conversation instead of rigidly following the order of questions in the interview schedule. In so doing, the researcher can ask for clarification and ask additional questions. In addition, based on their sensitivity, the researcher has the freedom to rephrase questions based on the attitudes and vocabulary of each participant. Besides facilitating the collection of rich and detailed answers, this method also increases the level of spontaneity and empathy during interview (Smith & Osborn, 2008).

Since knowledge on pre-performance routines and their perceived function on music performance is scarce, it was deemed appropriate that to allow for new information to emerge from the individual professional musicians it was necessary to opt for semi-structured interviews for the purposes of Study 2. This way, new information could be captured and compared across the group of participants as is the purpose of semi-structured interviews (Creswell et al., 2003). This type of interview allowed me to paraphrase questions according to participants' vocabulary use which I found particularly useful when communicating with foreign speakers of English. The semi-structured interview was also the choice of interview type because it allowed a degree of informality despite the formal interview setting. I found this particularly fitting especially because of the circumstances these interviews were conducted in, which was online, as the COVID-19 pandemic hit, and the first lockdown occurred right after time and place were established for all of the face-to-face interviews. The COVID-19 pandemic and its various lockdowns resulted in a greater desire for people to connect with each other in these difficult times. It therefore seemed fitting to conduct a type of interview which allowed for flexibility and for responding to each participant according to what they said and how they said it, making sure they felt properly listened to and appreciated for having consented to the interview.

Before the interviews took place, the interview schedule was piloted with four professional musicians. This was done to check whether the semi-structured interview was the right type of interview for Study 2, whether questions were clear and understandable, and whether questions generated the anticipated data. The piloting was also done so that I could practice my interviewing skills, and as Williamon et al. (2021) suggest, to find ways of how to deal with unexpected situations as they arise. Practising face-to-face interviews also allowed me to take note of participants' non-verbal cues and to respond by making adjustments.

Prior to the actual interviews I familiarized myself thoroughly with the interview schedule to make the interview feel as natural as possible. This enabled me to be flexible during interviews and to ask questions at their appropriate times. This meant that I also had to be confident enough to be able to improvise as necessary. There were instances during interviews in which participants asked to go off the record, so it was helpful to have practised making participants feel comfortable and to listen without judgment. As Williamon et al. (2021) suggest, I also practised using different types of questions to allow participants to do most of the talking. What I found to be equally important, however, was to practice ways in which I could gently redirect a conversation after a digression.

Three days before the scheduled interview, all participants were emailed the Participant Information Sheet and the Consent Form which they were asked to read, sign, and return prior to interview. The interview schedule followed the 6-stage plan outlined in Williamon et al. (2021). In the introductory stage I informed participants of the purpose of the interview and made sure participants understood what topics would be covered during interview. This stage allowed me to break the ice and to make participants feel comfortable. In the second stage, participants were made aware that the study had received ethical clearance, that their responses would be anonymized, and that they had the right to withdraw from interview at any given point. At this stage I also asked for permission to record the interview which I carried out digitally using an iPhone Xs (2018) and a MacBook Pro (2017).

The following stages included asking the first open question, structured in such a way to allow participants to give as little or as much detail on the research topic as they felt comfortable disclosing. The rest of the questions followed to gather the data necessary to answer the research question. I would like to point out that questions relating to participants' worst performance experience were left to the end of the interview to give participants time to ease into the interview and for me to gain their trust. As Williamon et al. (2021) suggest, leaving sensitive questions to the end will also avoid the premature termination of the interview in case participants do not wish to answer or do not want to continue with the interview. The penultimate stage was the follow-up stage where participants were given the opportunity to add anything else they wanted to share and for me tie any loose ends. The final stage consisted of thanking participants for their time, debriefing them on the project and offering to send a copy of findings once known.

2.3.3 Interpretative Phenomenological Analysis

Smith and Osborn (2015) describe Interpretative Phenomenological Analysis (IPA) as a detailed exploration of how participants make sense of their personal and social worlds, and the meanings that experiences, states and events hold for participants. As per this definition IPA seemed the best approach to address RQ3 in Study 2 (Chapter 4 and 5). Davidson (1999) also states that while IPA concerns itself with participants' perceptions it also takes into account the researchers' own conceptions, which are required to make sense of the world of participants. IPA, then, is a process of exploration in which personal experience and the perceptions of an authentic account are explored (Smith & Osborn, 2015). One of the strengths of IPA is that it allows the researcher this flexibility while still demanding rigour and depth in the methodological process involved in exploring individual perceptions (Taylor, 2014).

The role of the researcher in IPA is active as insight into the participant's world depends on the researcher's own conceptions which "are required in order to make sense of that other personal world through a process of interpretative activity" (Smith & Osborn, 2015, p.26.) This means that IPA involves two stages of interpretation, the first where participants try to make sense of their world, and the second where the researcher tries to make sense of participants trying to make sense of their own world (Smith & Osborn, 2015). In the context of Study 2, I aimed to establish an understanding of professional musicians' experience of pre-performance routines and their perceived impact on performance. This richly detailed and holistic representation of participants' words and routines was pertinent to the investigation on the perception of the impact of pre-performance routines on performance as I probed into the complexities of each individual's experience to develop a holistic understanding of pre-performance routines. As Williamon et al. (2021) state, IPA is used widely in music research. Examples of such research include Crawford's (2014) study on authentic learning in music education. Because in IPA the researcher is interested in the individual experiences, the procedure involves studying a small number of subjects to develop patterns and relationships of meaning (Moustakas, 1994). Study 2 studied 12 participants and results are presented as a set of convergences and divergences from participants' accounts.

While Smith and Osborn (2008) state that there is no definitive way of conducting IPA, they suggest five steps of analysis which I followed for Study 2 (see Chapter 4 and 5). The first stage consists in extracting meaning from the semi-structured interviews by reading the transcript multiple times and noting down anything which captures attention or is significant. Here I also summarized participant's words, highlighted connections and made initial interpretations. The second step involved generating themes by going over the transcripts once again and looking for phrases based on the notes made in the first stage. As Smith and Osborn (2008) suggest I based my themes on insights made in the first stage but trying to provide higher-level insights by using psychological terminology. The third step involved connecting themes by first listing them chronologically, then organizing them into clusters according to my interpretation of participants' trying to make sense of their world. While doing this I made sure themes captured participants' own words. Clusters were then given a name to represent superordinate themes and each superordinate theme had its set of themes with extracts from the data.

Stage four consisted in repeating stages one to three with all participants ending with a table of superordinate themes for each participant. The last stage consisted in listing all the superordinate themes across all participants and then producing a small group of final superordinate themes representing the full data set. I chose these superordinate themes based on how important I interpreted these to be among participants and on the weight they carried in answering RQ3 in Study 2 (Chapter 4 and 5). Participants' perspectives of these subordinate themes were then represented in sub-themes.

2.4 CONCLUSION

The chapter explained the choice of pragmatism as the epistemology for this project and how this was carried out using a multistrategy approach. The chapter progressed by detailing the approach to data collection and analysis by first outlining the appropriateness of surveys as the method of data collection for Study 1 and Study 3 and then discussing the strategies adopted to ensure the validity and reliability of the items and questionnaires used in these studies. Finally, the chapter discussed semi-structured interviews as the method of data collection for Study 2, with IPA analysis.

CHAPTER 3

Pre-performance routines in professional orchestral musicians

Study 1

3.1 INTRODUCTION

In many fields, and notably in sport, pre-performance routines (PPRs) are consistently regarded as determining the likelihood of effective performance (Cotterill, 2014). The terminology in the literature refers to such activities as either pre-performance routines, pre-shot routines or mental preparation routines (Cotterill, 2010). Definitions in the literature also vary (Crampton, 1989; Foster et al., 2006). However, most studies have readily accepted Moran's (1996) definition of PPRs as "a sequence of task-relevant thoughts and actions which an athlete engages in systematically prior to his other performance of a specific sports skill" (p.177). The popularity of PPRs stems from their link with performance and have therefore been implemented in open skill sports such as rugby union (Jackson and Baker, 2001; Jackson, 2003) and in closed skill sports such as the golf shot (Shaw, 2002; Cotterill, 2008).

Research in sport has invested in a considerable number of pre-performance routine interventions to help athletes perform in high stress situations. These studies test interventions to alleviate "choking", a term described by Mesagno and Hill (2013) as an acute decrease in skill execution through anxiety and perceived pressure. These interventions are either based on the distraction or the self-focus models. The distraction model suggests that choking occurs because an athlete's attention shifts from task-relevant cues to task-irrelevant ones when in a state of heightened anxiety. According to Hardy et al. (2001) and Mullen et al. (2005) attention could shift from task-relevant cues to internal distractions, such as worries about a score and its consequences, surpassing the threshold for attentional capacity and therefore decreasing the potential attentional space needed for optimal performance. Distractions can also be external, such as crowd noise or distracting fans which allow the shift in attention to other irrelevant cues. In both internal and external distractions, athletes report negative thoughts and worries to these factors, which they then attribute to their inferior performance (e.g. Hill & Shaw, 2013). The distraction model gave rise to distraction-based interventions to prevent choking. Such interventions promote task-relevant focus of attention during the execution of a skill and aim at preventing both internal and external distractions. In this context, pre-performance routines are used as distraction-based interventions consisting of deep breathing, cue words, countdown to performance, and cognitive and behavioural preparation. In an intervention study on ten-pin bowlers, for example, Mesagno et al. (2015) used pre-performance routines which included optimal arousal levels such as deep breathing, attentional control such as focusing on a target, behavioural steps including routines such as wiping the ball off with a towel, and cue words.

Some interventions are also based on the self-focus model of choking. This model suggests that performance decreases under pressure because of an increase in the attention of (Beilock & Carr, 2001) and the step-by-step control of (Jackson et al., 2006) the execution of a well-learned skill. Interventions based on the self-focus model, therefore, aim at minimising the reinvestment of explicit knowledge and the conscious control of skill execution through distal methods (Gropel & Mesagno, 2019). Liao and Masters (2001), for example, reduced the accumulation of explicit knowledge during skill acquisition by having table tennis novices learn by analogy how to hit forehand topspin. Mesagno et al. (2009) minimised the reinvestment of explicit knowledge and conscious control through an ad hoc intervention which diverted attention away from focusing on the step-by-step execution of a skill by using task-irrelevant dual tasks. In this study, basketball players practised free throws while listening to music in the second phase of the study to facilitate performance under pressure.

Although not primarily created to prevent distractions or minimize self-focus, acclimatisation is a third type of intervention that aims to reduce the feelings of pressure that may otherwise lead to distraction or self-focus. Studies adopting this intervention have shown that this acclimatisation affects, rather than effects, the experience of pressure but nonetheless it effectively prevents choking. The study by Balk et al. (2013), which uses reappraisal cues in practising a golf putting task for example, showed that while control participants decreased performance under pressure, golfers using cognitive reappraisal holed the same number of putts as in baseline.

The ability of effectively preparing to execute complex skills in high pressure situations is not only essential in sport, but also across all performance domains. However, to date, literature that has specifically explored PPRs in fields other than sport is scarce, and except for one study (Cotterill, 2014), PPRs have rarely been the focus of the investigation. In Cotterill's study, a qualitative approach was used to explore the preparation strategies employed by participants from the fields of sport, music, performing arts and medicine. The results suggested similarities between the behavioural and the mental strategies adopted by performers in these various domains. Performers' preparation, for example, involved specific and functional behaviours linked to performance, such as musicians in Cotterill's study reporting finger stretching to help know where fingers would be playing, and athletes glancing at the target and retaining that image while looking at the ball before shooting. Mental strategies across domains included positive self-talk, visualisation, managing emotion, focusing, meditation / yoga and relaxation. Cotterill (2014) states that the developmental approaches to PPRs may be transferable from the realm of sport to other performance domains.

However, as already seen in Chapter 1, pre-performance routines have not been readily applied in the context of music performance. No research exists which focuses on investigating pre-performance routines in music and no research exists that explores the reasons behind musicians' engagement with these routines.

3.2 AIMS OF STUDY 1

Given the current state of understanding surrounding pre-performance routines and performance optimisation in sport and other performance domains, Study 1 aimed to investigate pre-performance routines in the field of music. It aimed to do so by firstly investigating what, if any, pre-performance routines professional musicians adopt prior to performance, the extent to which these are used, and the reasons behind these routines. Study 1 therefore aimed to answer the following research questions:

RQ1: What, if any, pre-performance routines do professional musicians engage in prior to performance and does this change during the pre-performance period?

RQ2: What are the reasons behind musicians' engagement and change in pre-performance routines?

Understanding professional musicians' perceived functions of pre-performance routines towards performance enhancement would help form a clearer picture of which pre-performance routines need to be investigated and which of these would be more likely adopted by professional musicians.

3.3 METHOD

3.3.1 Rationale for using the *Pre-performance Routines* survey

The method of data collection for Study 1 was a one-shot survey. As already stated in section 2.3.1, literature states that surveys provide a numeric description of a population's trends, attitudes and opinions, and can be cross-sectional, capturing participants' responses at a particular point in time (Babbie, 1990). The aim of the *Pre-Performance Routines* survey was in fact to capture the responses of professional musicians at a point in time and to be able to generalize responses from a sample of professional musicians to make inferences about their routines prior to performance and their perceptions of these routines on performance.

3.3.2 Rationale for the content of the *Pre-performance Routines* survey

To ensure the validity of a set of items in the *Pre-performance Routines* survey, addressing what, if any, pre-performance routines professional musicians adopt prior to performance (RQ1), the following standardised questionnaire was used: Musicians Pre-Performance Survey (MPPS; Steptoe et al., 1995). There is some inconsistency in the MPPS in that the list of behaviours in the questionnaire also include thoughts. The term "behaviours" has therefore been used throughout this chapter to refer to the thoughts and actions described as part of Moran's (1996) definition of pre-performance routines and to correspond with Steptoe's use of "behaviours" in the MPPS.

The literature suggests that if there is no relevant validated questionnaire to measure a particular construct, a questionnaire needs to be developed (Boynton, 2004; Creswell & Creswell, 2017; Williamon et al., 2021). Since there is no existing questionnaire on the pre-performance period or on the perceived functions of pre-performance routines on music performance, the *Pre-performance Routines* survey included newly developed questions to investigate these constructs and address RQ1. To ensure validity and reliability of these items, the survey was first piloted and disseminated via SurveyMonkey.com through email invitations to 15 professional and postgraduate instrumental conservatoire students. Statistical tests were also run to check whether the type of data collected was appropriate for the tests needing to be run. Participants' feedback on the pilot study was integrated into the amended final version of the online survey. The project was then approved by the Conservatoires UK Research Ethics committee. Once the *Pre-Performance Routine* survey was sent out to participants, data collected and analysed, internal reliability of the 14 items was quantified using Cronbach's alpha. The internal reliability was high $\alpha = .80$.

3.3.3 Design of the *Pre-performance Routines* survey

The *Pre-performance Routines* survey (see Appendix 1) was designed for two purposes: (RQ1) to explore what, if any, pre-performance routines classical instrumentalists adopt and whether these change during the pre-performance period; (RQ2) to find the reasons behind musicians' engagement and change in these pre-performance routines. To explore RQ1, it was first necessary to identify the onset and duration of the pre-performance period within musicians. To this end, the definition of the pre-performance period provided in the survey was "the time in which you engage in task-relevant thoughts and actions leading to a musical performance". The survey was divided in four main sections: (i) demographics, (ii) information on professional and/or student profiles, (iii) behaviours and reasons for behaviours prior to different performance scenarios, (iv) behaviours and the reasons for these post-performance in different performance scenarios. For sections (iii) and (iv) behaviours were divided into five different performing scenarios: large ensemble, chamber group, accompanying, solo recitals, and audition/competition. Sections (iii) and (iv) required participants to report on whether they increased, decreased, or did not change any of the applicable behaviours both pre- and post-performance.

This chapter, however, only concerns itself with areas (i), (ii) and (iii). As previously stated, the sample size of participants performing in scenarios other than large ensembles was too small to be effectively compared to large ensemble musicians. Similarly, data relating to post-performance behaviours were sparse and could not be used effectively. Despite the fact that the survey had been purposely planned not to be too long with the aim of enhancing participation and increasing probability of its completion, it still required 30 minutes of participants' time. This may have contributed to the low response rate especially with regards to the later sections of the survey.

To investigate RQ1, the *Pre-performance Routines* survey was based upon Steptoe et al.'s (1995) Musicians Pre-Performance Survey (MPPS). The items in the MPPS were originally construed by Steptoe (1983) as behaviours or activities used by musicians to cope with stressful situations. The MPPS was then used by Steptoe (1987) to investigate stage fright in orchestral musicians and again in 1995 to investigate the impact of stage fright on student actors. Although the aim of both Steptoe's studies was to investigate stage fright, the MPPS remains the only exant questionnaire that investigates behaviour in performing artists prior to performance. For this reason, together with MPPS's length, consisting of only 13-items, MPPS was deemed ideal to include in the *Pre-performance Routines* survey.

However, for the purposes of Study 1, some modifications were made to the MPPS. The instructions to the original survey asked participants for behaviours in which they engaged in the 2 hours prior to performance. For the scope of the present study, these instructions were changed to behaviours musicians engaged in during their pre-performance period, where the pre-performance period was defined as the time in which a performer engaged in task-relevant thoughts and actions leading to a musical performance. This change was affected to account for the individual differences in performance preparation between musicians. Two further items were also added to the original 13 items (12 items on behaviour + 1 optional "other") making it a 15-item questionnaire (14 items on behaviour + 1 optional "other"). The new added items were "talking to your teacher/mentor prior to performance" and "talking to co-performers about performance". These additions were carried out to cater for participants playing in ensembles and for music students. Steptoe et al. (1995) also employed a 4-point scale to determine which behaviours participants increased prior to performance. To avoid the bias implied in asking participants to rate the increase in behaviours by selecting one of either "often", "sometimes", "rarely" and "never", participants in the *Pre-performance Routines* survey were asked to rate each of the behaviours according to whether they "decrease", "increase", make "no change" to, or find the behaviour listed "not applicable" to them. The order and wording of the questionnaire was left in its original format.

To investigate RQ2, respondents were invited to give reasons for their engagement in the behaviours applicable to them pre-performance.

The full survey is available in Appendix 1.

3.3.4 Participants

An online survey entitled *Pre-performance Routines* was sent to English-speaking international professional musicians and instrumental conservatoire students. Creating the *Pre-performance Routines* survey online allowed for the use of the survey platform Surveymonkey, allowing for the use of digital tools such as survey logic to direct participants to the next set of questions depending on the answer given to previous ones. It also allowed marking items as mandatory, disallowing participants to skip and proceed till the necessary questions were answered, thus minimizing problems associated with missing data. Using an online survey also allowed for the easy export of electronic data collection to Excel spreadsheets and Jamovi, the analysis software used for quantitative data analysis in this thesis (see Chapter 3 and 6).

The intention of the *Pre-performance Routines* survey was to recruit as broad a spectrum of classical musicians as possible who were over 18 years of age. Direct email invitations were sent to orchestral bodies and conservatoires internationally. Email invitations were also sent out to individuals who were either chosen because they are well-known artists or because they were in the researcher's professional networks. Recruits were invited to forward the email invitation to others they thought may be interested as a snowballing technique. To be as comprehensive as possible, the survey was not only sent out to English-speaking orchestras and conservatoires but also to orchestras and conservatoires in countries with a good level of English proficiency.

Informed written consent was obtained at the start of the online survey and all responses were anonymous. A total number of 124 participants completed or nearly completed the survey, with at least one of the five scenarios. Out of 124 responses, 94 were from professional musicians. The responses from postgraduates (n = 12) and undergraduates (n = 18) making up the remaining 30 responses were excluded from analysis since these constituted too small comparative groups. Of the 94 professional musicians, most performed in more than one scenario, with 90 performing in large ensembles, 91 in chamber groups, 30 as accompanists and 66 as soloists. Given these figures, analysis was only performed on respondents performing in large ensembles as data from other chamber group and solo scenarios were incomplete and sample size for accompanists was too small. No comparisons could therefore be run between the pre-performance routines in orchestral musicians and musicians performing in any of the other four scenarios.

The majority of participants identified as female (n = 54, 60%). Respondents were aged between 25-74 years (mean age = 46.3, SD = 12.8). The largest group of participants (n = 27, 30%) was over 55 years of age. Respondents between the ages of 25-34 and 45-54 made up

24% (n = 22) of respondents respectively. The smallest group of participants was between the 35-to-44-year bracket (n = 19, 21%).

The majority of respondents were string players (n = 52, 58%), about half of which were violinists (n = 23, 26%) and violists (n = 19, 21%). A fifth of participants belonged to the brass section (n = 22, 24%), 12% to the woodwind section (n = 11), 4% were keyboardists (n = 4) while only 1 participant belonged to the percussion group. This sample of participants is similar to other surveys concerning Western professional orchestral musicians in terms of the proportions included in the different orchestral sections (Harper, 2002; Ackermann et al., 2014; Berque et al., 2016).

3.3.5 Analysis

After completing data collection and excluding unsuitable responses, statistical analyses were performed using the statistical package Jamovi (version 1.2.27.0). Data were first analyzed using descriptive statistics to provide an overview of general patterns in professional musicians such as duration of the pre-performance period, behaviours employed prior to performance, and the reasons behind these behaviours. The Shapiro-Wilk test was employed because of the relatively small sample size (n = 90) and its specificity to test for normality. Results indicated that the scores for most variables showed significant deviations from normality ($p < .05$). Skew values varied from .0942 to .700. Kurtosis values also varied between -1.87 to -.641. As skewness and kurtosis statistics are very dependent on sample size and can therefore be misleading, histograms and q-q plots were also consulted. As both of these confirmed a non-normal distribution of data, it was concluded that the data set within this study showed significant deviations from normality. Thus, non-parametric tests were used to calculate all inferential statistics.

A correlation matrix was also constructed to explore the relationship between demographic variables, aspects of musical experience and duration of the pre-performance period. Since the test for normality of distribution showed significant deviations from normality (Shapiro-Wilk $p < .05$), Kendall's tau-b correlation coefficients were calculated.

To explore the factorial structure of the MPPS, all 14 items were subjected to an explanatory factor analysis with promax rotation. The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis, $KMO = .60$. Bartlett's test of sphericity χ^2 (294) = 91, $p < .001$ indicated that the correlation structure was adequate for factor analyses. The maximum likelihood factor analysis with a cut-off point of .40 yielded a five-factor solution as the best fit for the data. This allowed for a reduction of data and underlying relationship between subscales.

Following the factor analysis, data were transformed to provide a score of behaviours within each factor (0 = absence and 1 = presence of each). These summary scores per factor were then examined to see the most common behaviours as proportions, and as contingency tables (with chi-square tests) in relation to the demographic variables, aspects of musical experience, and duration of the pre-performance period.

Free-response text comments were also extracted from the survey. Given that only a small number of participants provided comments and that the information supplied was brief, the text analysis was conducted by hand, grouping comments into themes.

3.4 Results

3.4.1 The Pre-performance period

The majority of respondents (56%, n = 50) indicated that they had spent over 35 years playing their main instrument. Of these, 50% reported having spent between 35-44 years and over 45 years, respectively. These were followed by 23% (n = 21) spending between 25-34 years of playing, 19% (n = 17) between 15-24 years, and 2% (n = 2) less than 15 years. More than a third of participants (39%, n = 35) reported playing less than 60 performances annually. This was followed by 33% (n = 30) giving between 60-120 performances annually, and 28% (n = 25) giving over 120 performances each year.

The reported pre-performance period for professional orchestral musicians covered a wide range, from 5 minutes to 4 weeks prior to performance, with a median of 180 minutes (mean = 2629, SD = 7065), equivalent to 3 hours. Figure 3.1 shows that there were somewhat higher rates for pre-performance periods between 20-30 minutes and 40-60 minutes, and those between 2-4 hours and 6 hours. On the other hand, pre-performance periods under 15 minutes and over 1 week were rare.

3.4.2 (RQ1) Change in behaviour prior to performance

Scales examined change in pre-performance behaviours in relation to the day of performance. Results show that overall, the behaviours either increased or did not change. As can be seen in Figure 3.2 below, six behaviours were reported as increasing, seven as not changing, and one was reported as decreasing prior to performance. As per Figure 3.2, the behaviour reported as increasing the most during the pre-performance period was going over notes/chords/passages/scores which have been well-prepared, reported by 76% (*n* = 68) of participants. This was followed by going over notes/chords/passages/scores which have not been well-prepared (58% *n* = 52) and deep breathing and relaxation exercises (including stretching) reported by 49% (*n* = 44) of respondents. Other reported increases in behaviour included being alone (50%, *n* = 45), meditating (33%, *n* = 30) and taking sedatives (19%, *n* = 17).

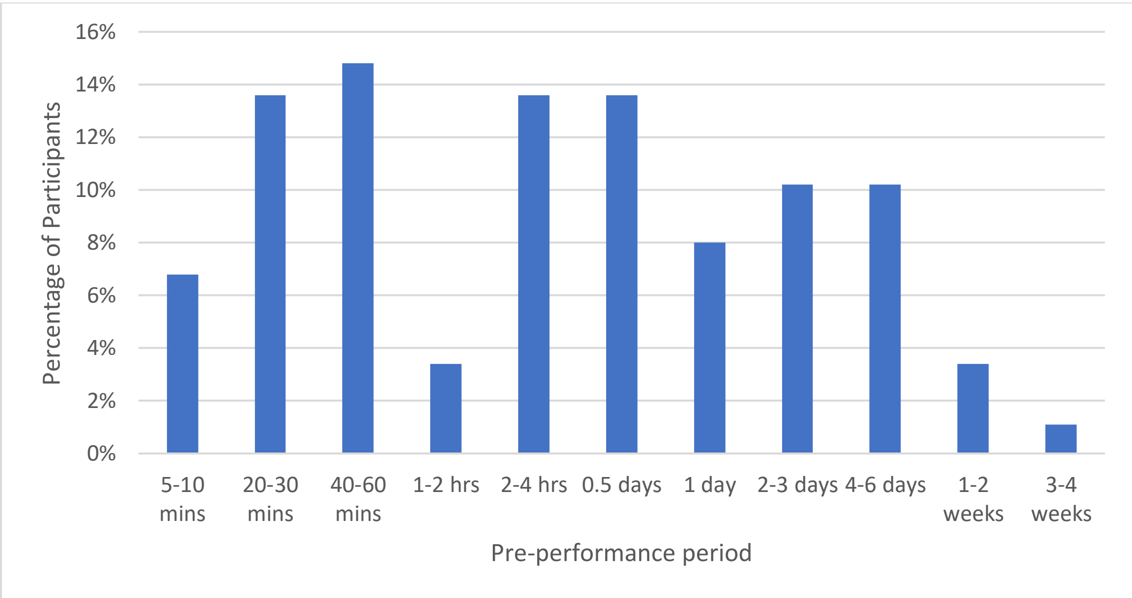

Figure 3.1 Duration of the pre-performance period among professional orchestral musicians

Meanwhile, behaviours reported as not changing during the pre-performance period were reading something distracting (61%, *n* = 55), thinking about other things to keep the mind off performance (56%, *n* = 50), going out with friends (50%, *n* = 45), exercise (50%, *n* = 45), talking to co-performers (40%, *n* = 36), talking to one's teacher/mentor about performance (30%, *n* = 27), and smoking cigarettes (10%, *n* = 9). The one behaviour reported as mostly decreasing prior to performance was drinking alcohol (32%, *n* = 29) while going out with friends was the behaviour reported to decrease the most prior to performance (34%, *n* = 31). Meditation, deep breathing/relaxation exercises, and taking sedatives were behaviours reported as decreasing the least by 1% (*n* = 1) of participants respectively. N/A refers to behaviours that participants did not engage in prior to performance.

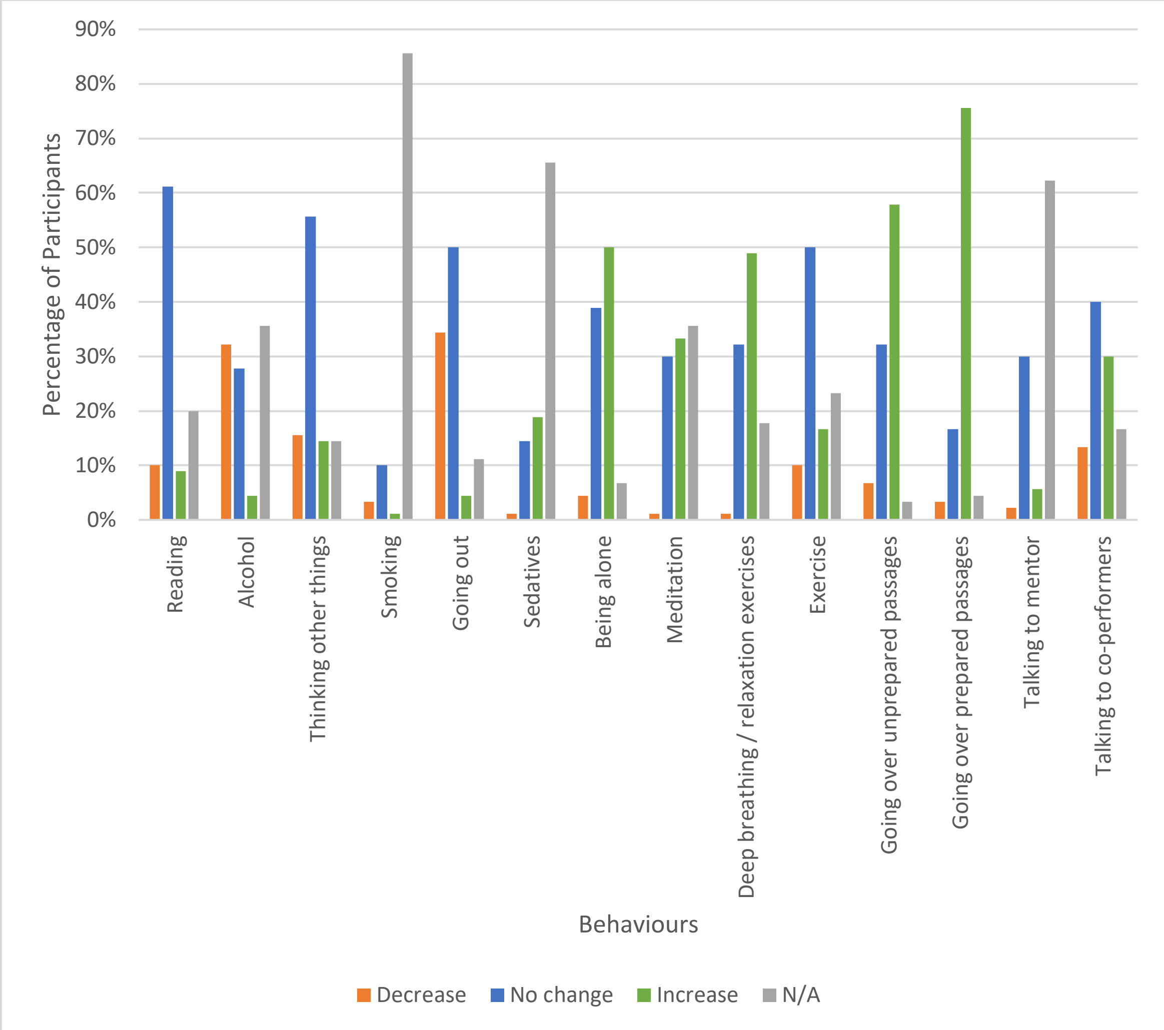

Figure 3.2 Change in behaviours in professional orchestral musicians during their pre-performance period

Correlations were run between the demographic variables, aspects of musical experience and duration of the pre-performance period. A positive association was found between gender and instrument family (τb = .200, p = .041). When this was further examined using a contingency table it showed that while 64%, (n = 36) of females played string instruments, this compared with only 43% (n = 16) of males who played strings (χ^2 (4, N = 90) = 12.230, p = .016).

Positive correlations were also reported between age and number of years spent playing main instrument (τb = .808, p = <.001), age and number of yearly performances (τb = .151, p = .041), and years spent playing main instrument with number of yearly performances.

To explore the factorial structure of the MPPS, all 14 behaviours were subjected to an explanatory factor analysis. The five factors obtained are identified and labelled below.

(i) **Physical Readiness** with three sub-scales: deep breathing/relaxation exercises (including stretching), meditation, and exercise. This factor had a SS loading of 1.89 and accounted for 13.51 % of the variance.

(ii) **Technical preparation** with two sub-scales: going over notes/chords/passages that have been well-prepared, and going over notes/passages that have not been well-prepared. This factor had a SS loading of 1.31 and accounted for 9.39% of the variance.

(iii) **Substance-intake** with two sub-scales: smoking cigarettes and taking sedatives. This factor had a SS loading of 1.41 and accounted for 10.07% of the variance.

(iv) **Distraction Methods** with four sub-scales: thinking about other things to keep the mind off performance, reading something distracting, drinking alcohol, and going out or meeting with friends. This factor had a SS loading of 1.26 and accounted for 9.04% of the variance.

(v) **Talking to Other Musicians** with two sub-scales: talking to one's mentor and talking to one's co-performers about your performance. This factor had a SS loading of 1.13 and accounted for 8.07% of the variance.

Table 3.1 (on the next page) shows the factor analysis.

Table 3.1 Explanatory Factor Analysis of the Behaviours in the MPPS

Items	**Factor**				
	1 Physical Readiness	**2 Technical Preparation**	**3 Substance-intake**	**4 Distraction Methods**	**5 Talking to Other Musicians**
Deep breathing/relaxation exercises (including stretching)	**1.04**	-.09	.15	-.02	-.09
Meditation	**.53**	-.01	.15	-.13	.33
Exercise	**.51**	-.02	-.15	.13	.33
Alone	.21	.14	-.05	.06	-.05
Going over notes/chords/passages that have been well-prepared	.00	**.46**	.01	-.02	.01
Going over notes/chords/passages that have not been well-prepared	-.02	**1.06**	-.00	-.21	-.04
Smoking cigarettes	-.12	-.07	**.98**	.05	.23
Taking sedatives	.28	.06	**.56**	.03	-.11
Thinking about other things to keep the mind off performance	.04	-.11	.02	**.69**	-.02
Reading something distracting	.09	-.17	-.03	**.64**	-.08
Drinking alcohol	-.10	.08	.18	**.45**	-.02
Going out	-.10	.19	-.08	**.42**	.24
Talking to one's mentor	.18	-.09	-.11	-.05	**.61**
Talking to one's co-performers	-.06	.03	.13	-.00	**.56**
Cronbach's alpha (α)	.77	.61	.74	.59	.58

Notes: Extraction method; maximum likelihood; Rotation method; Promax. Loadings larger than .40 are in bold.

With the transformed data scores for engagement in each of the types of 5 categories of behaviours identified in the factor analysis, the scores were examined as proportions (see Table 3.2).

Table 3.2 Proportions of respondents with 5 categories of pre-performance behaviours (total score by factor).

Score	**1. Physical Readiness** **% (*n*)**	**2. Technical Preparation** **% (*n*)**	**3. Substance-intake** **% (*n*)**	**4. Distraction Methods** **% (*n*)**	**5. Talking to Other Musicians** **% (*n*)**
0	13.3 (12)	11.1 (1)	63.3 (57)	5.6 (5)	16.7 (15)
1	11.1 (10)	5.6 (5)	25.6 (23)	3.3 (3)	47.8 (43)
2	14.4 (13)	93.3 (84)	11.1 (10)	10.0 (9)	35.6 (32)
3+	61.1 (55)	-	-	28.9 (26)	
4		-	-	52.2 (47)	
Total N	90	90	90	90	90

It can be seen that with the exception of Substance-intake, most respondents engaged highly in each category of behaviour. Substance-intake was used by only around a third of the sample (33/90).

The Chi-square test for independence was also run between the total scores in the five factor categories and demographic variables (gender, age), aspects of musical experience (family of instruments, years spent playing main instrument, number of yearly performances) and the duration of the pre-performance period. Significant differences were found only between the Physical Readiness total score and Family of Instruments played (see Table 3.3), with respondents playing woodwind having the highest total score (72.7%) followed by string instruments (71%).

Table 3.3 Contingency table for Factor 1 Physical Readiness and Family of Instruments

Family of Instruments		Physical Readiness (Score 0-3) 0	1	2	3	Total
Keyboard/percussion	Observed	2	0	2	1	5
	% within row	40.0 %	0.0 %	40.0 %	20.0 %	100.0 %
Woodwind	Observed	0	2	1	8	11
	% within row	0.0 %	18.2 %	9.1 %	72.7 %	100.0 %
Strings	Observed	4	4	7	37	52
	% within row	7.7 %	7.7 %	13.5 %	71.2 %	100.0 %
Brass	Observed	6	4	3	9	22
	% within row	27.3 %	18.2 %	13.6 %	40.9 %	100.0 %
Total	Observed	12	10	13	55	90
	% within row	13.3 %	11.1 %	14.4 %	61.1 %	100.0 %

Note: χ^2 (12, N = 90) = 21.8, p = .039
Physical Readiness: 0 = n/a, 1 = Deep breathing/relaxation exercise, 2 = Deep breathing/relaxation exercises + meditation, 3 = Deep breathing/relaxation exercises + meditation + exercise.

A relationship was found between more Talking to Other Musicians and the Number of Yearly Performances (χ^2 (8, N = 90) = 19.6, p = .012) (see Table 3.4). Thus 50.5% with high score on the former had 50 more yearly performances.

Table 3.4 Contingency table for Factor 5 Talking to Other Musicians and Number of yearly Performances

Number of yearly performances		Talking to Other Musicians (Score 0-2) 0	1	2	Total
1 (0-25)	Observed	2	6	6	14
	% within row	14.3 %	42.9 %	42.9 %	100.0 %
2 (25-30)	Observed	9	10	2	21
	% within row	42.9 %	47.6 %	9.5 %	100.0 %
3 (50-80)	Observed	2	4	6	12
	% within row	16.7 %	33.3 %	50.0 %	100.0 %
4 (80-100)	Observed	2	9	7	18
	% within row	11.1 %	50.0 %	38.9 %	100.0 %
5 (100+)	Observed	0	14	11	25
	% within row	0.0 %	56.0 %	44.0 %	100.0 %
Total	Observed	15	43	32	90
	% within row	16.7 %	47.8 %	35.6 %	100.0 %

χ^2 *(8, N = 90) = 19.6, p = .012*
Talking to Other Musicians: 0 = n/a, 1 = Talking to own mentor about your performance, 2 = Talking to own mentor about your performance + talking to own co-performers about your performance.

3.4.3 (RQ2) Insight into the change in pre-performance behaviour

Word frequency analysis of the free-text responses shows that the most common reason associated with a reported change in behaviour was the need to “focus” on upcoming performances (n = 86). Other reasons given for the reported change in behaviour included aiming to enhance “relaxation” (n = 23), “calmness” (n = 18), reducing “performance anxiety” (n = 18), “conserve energy” (n = 10) and “sleep better” (n = 6). To note is that while some performers reported increasing behaviour with a view of reaching a particular goal, others reported not changing or decreasing the same behaviour with the aim of achieving the same goal. This suggests that the perceived functions that behaviours fulfil are different across musicians.

The reasons given by participants for the reported increase in behaviours prior to performance were various. With as regards to going over notes/chords/passages that have not been well-prepared participants stated that they did so before performance as “often there is not enough rehearsal” to go over the whole repertoire. Another participant added that last minute practise “happens with overload of work and that's the last chance to do your best during the performance.” Participants also perceived going over notes/chords/passages that have not been well-prepared as a means of warming-up fingers, hand and arms, to reinforce muscle memory, and enhance focus and relaxation.

Being alone was another behaviour reported as increasing prior to performance. While one performer stated that they increased being alone “to prevent myself picking up on other people's stress”, another participant reported decreasing alone time to “help relax” and unwind. Among the reasons participants gave for increasing being alone was to allow time in which to focus on the upcoming performance. As one performer put it, being alone “quiets my mood and keeps me focused.” Other participants stated that being alone allowed them to “stop intrusive noise” and “avoid getting irritated by chatter if I feel under pressure”. The latter helped them towards “preserving [my] focus and energy as socialising is quite exhausting.” Other participants reported increasing alone time to be able to take a nap, meditate, engage in self-talk to enhance confidence, practise going over scores, and control breathing.

With as regards to meditation and deep breathing/relaxation exercises (including stretching) participants reported an increase in both behaviours to enhance focus, relaxation and a sense of calm, as well as improve sleep. Participants reported that increasing meditation enhanced self-confidence and helped control breathing, while increasing breathing/relaxation exercises helped to warm-up, prevented injuries, reduced heart rate and physical tension, enhanced breathing ability and wellbeing, and helped feeling grounded. Meditation and deep breathing/relaxation exercises were also perceived as reducing performance anxiety. For one participant, an increase in meditation “is vital to control my anxiety before a concert.” Similarly, for another participant, an increase in deep breathing/relaxation exercises “takes my heartbeat[ing] down if stressed.” Sedative intake was also reported as increasing to help cope with performance anxiety “if there is a situation very different from what I am used to.” Another participant highlighted the effect a different scenario might have on their performance anxiety when stating that they increased sedative-intake to help them cope with situations where they played exposed orchestral sections and solo concerts.

Most participants did not give reasons for the behaviours they reported as not changing prior to performance. However, with as regards to exercise, one participant stated that “a walk can be quite refreshing and calming - so can be [a] useful tool”, while another stated that exercise “releases extra energy”. Exercise was also reported as increasing prior to performance to enhance “focus”, “calm” and “relaxation”, “helps keep [me] positive,” “gets rid of anxiety,” “releases extra energy” and “reduces physical tension”.

As for behaviours reported as decreasing prior to performance, the reasons given for the reduction in alcohol were to enhance alertness, increase focus and improve sleep. Participants stated that they also decreased exercise prior to performance “to help with focus”. Respondents decreasing time alone indicated that they did so to enhance relaxation or because it was difficult to find a space in which they could be alone backstage without “other persons around distracting my thoughts”.

Participants were also given the option of including behaviours they adopted prior to performance which were not included in the list of behaviours provided in the survey. Respondents included diet monitoring, reported by 12% (n = 11) of respondents, visualisation (3%, n = 3) and napping (3%, n = 3). Other behaviours included listening to recordings of the piece about to be performed, warming up on one’s instrument, using technical strategies such as slow playing for intonation purposes, mental rehearsal, practising tai chi, grounding rituals, bicycle rides, and arriving early at the performance venues.

3.5 DISCUSSION

Professional orchestral musicians reported a wide range in the duration of their pre-performance period. As no literature exists relating to this period of time in which a musician starts readying mentally and physically for performance, and no literature has investigated the pre-performance period and other facets of performance, it was thought that the duration of the pre-performance period might be indicative of music performance anxiety and that therefore, the pre-performance period in musicians might vary according to performance scenario. However, as data collected on the different performance scenarios were scarce and only data concerning professional orchestral musicians could be analysed, no comparisons could be drawn between the pre-performance period and the different performance scenarios.

With reference to the above, the variables of age and experience (years spent playing main instrument and number of performances given yearly) were expected to impact orchestral musicians’ pre-performance period. While there is literature reporting that age and experience are negatively associated with performance anxiety (Lehrer, 1981; Steptoe and Fidler, 1987), there is also research which reports no association between these variables (Steptoe et al., 1995). Although there is no evidence that pre-performance period is indicative of music performance anxiety, this study showed no significant associations between age, years spent playing main instrument, number of performances given yearly, and the pre-performance period. This shows that the pre-performance period is not likely to be a function of exposure to a performance setting. Results also showed that the duration of the pre-performance period is not likely to impact any of the 14 behaviours. However, it is possible that associations might emerge in a sample which is larger and more varied than the present one.

Although the median for the pre-performance period was of 3 hours, 26% of orchestral musicians reported it as being between 2 to 6 days. This is of concern when one considers that the number of weekly performances in orchestras range from one to three times in symphonic/philharmonic orchestras, and up to ten times weekly for pit orchestras. With some pre-performance periods being 2 to 6 days in duration for each performance given, it becomes difficult to imagine some orchestral musicians finding time to unwind in between. With literature suggesting that orchestral musicians face an increased risk of mental health issues (Kegelaers et al., 2020) arising from multiple stressors such as music performance anxiety (Kenny et al., 2014) it is worth for future research to investigate the relationship between the pre-performance period and performance, and the impact this may have on musicians' health and wellbeing. More specifically, as the sample size in Study 1 was too small to compare differences between the long and short pre-performance periods, future research could invest in comparing respondents with a pre-performance period under 1 day versus those with a pre-performance period of 1 day and above, further exploring whether and in what ways, factors such as character traits and pre-performance routines might determine the duration of the pre-performance period.

Study 1 showed that with the exception of being alone, all behaviours orchestral musicians engaged in prior to performance could be grouped into five categories: Physical Readiness, Technical Preparation, Substance-intake, Distraction Methods and Talking to Other Musicians. Findings also showed that most behaviours were reported as not changing prior to performance. This might suggest that such behaviours are part of an orchestral musician's daily/weekly routine but are not perceived as having an impact on performance. They are therefore not increased or decreased prior to performance. Given that half of all behaviours were reported as not changing prior to performance, such as exercise (Physical

Readiness), thinking about other things to keep mind off performance / reading something distracting / going out with friends (Distraction Methods), smoking cigarettes (Substance-intake), and talking to teacher/mentor and talking to co-performers about one's performance (Talking to Other Musicians), it would be worth examining the reasons behind this choice. However, most participants reporting not changing behaviour prior to performance did not provide any reasons for doing so.

The only exception to the above is in the reasons given for not changing exercise prior to performance. Participants stated that they did not change exercise prior to performance as it was a useful tool towards enhancing a sense of calm and in releasing extra energy. Although the reasons given were scarce and results cannot be generalized, it can be suggested that not responding might imply that physical exercise is part of a musician's daily/weekly routine and is therefore carried out for its own sake without a view of enhancing performance, while the responses given reaffirm the presence of physical exercise in a musician's daily/weekly routine and show that participants actively choose not changing exercise prior to performance with a view of enhancing performance.

This behaviour, reported by 50% of participants, contrasted with that of 17% of respondents who, while sharing the same view of wanting to enhance performance through exercise, reported increasing this activity prior to performance. Among the reasons given for this increase in behaviour was that exercise is perceived as enhancing focus and relaxation, improves mood, and relieves anxiety and tension. This is line with the literature which highlights the importance of exercise in enhancing mood (Biddle and Fox, 2003) and speed and capacity to process information (Boutcher, 2000), and reduces anxiety (Taylor, 2000).

This reported increase in exercise was also in contrast to 10% of participants who reported decreasing exercise to help focus prior to performance. These findings showed that while some participants may engage in exercise prior to performance because it is part of their daily/weekly routine, others engage in it with a view of enhancing performance by engaging in different and contrasting behaviours.

Results also showed that 23% (n = 21) of participants reported exercise as not applicable to them. This suggests that 23% of orchestral musicians do not engage in exercise as part of their daily/weekly routine. Previous research suggests that musicians' engagement in exercise is limited (Kreutz et al., 2008, 2009; Panebianco-Warrens et al., 2015; Araujo et al., 2017) and that a lack of physical activity combined with stressful work environments can lead to negative health consequences which include locomotion and musculoskeletal problems (Rickert et al., 2014). Although findings from Study 1 showed that the majority of professional orchestral musicians engaged in exercise and are therefore in line with more recent research by Matei and Ginsborg (2020) and Araujo et al. (2020) which indicate that higher education students engage and meet general physical activity recommendations, future research would need to investigate the physical activity/exercise in professional musicians. Study 3 therefore investigates physical activity/exercise in professional musicians, and it explores its perceived function on performance while investigating its potential impact on musicians' health and wellbeing.

Among the behaviours reported as increasing prior to performance were going over notes/chords/passages that have been/have not been well-prepared, both of which make up the Technical Preparation category. Going over notes/chords/passages that have not been well-prepared comes as no surprise when one considers the high turnover of weekly orchestral performances. As participants stated, there is often not enough rehearsal time to go over the whole of the repertoire. However, in other cases, going over passages that have not been prepared enough also serve as a warming-up exercise, to reinforce muscle memory, and to enhance focus and relaxation.

As in the case for exercise, findings showed that musicians engaged in contrasting behaviours with the aim of achieving the same goal. To help cope with performance anxiety, for example, some participants reported increasing going over notes/chords/passages/scores that have not been well-prepared to help prepare for performance and boost confidence, while others chose to increase going over notes/chords/passages/scores that have been well-prepared instead to boost confidence levels and help control performance anxiety. This suggests that the perceived functions of the behaviours engaged in prior to performance are different across musicians.

This contrasting behaviour also emerged in being alone, meditation, and deep breathing/relaxation exercises. With regards to being alone, findings showed that musicians reported increasing or decreasing alone time to achieve relaxation. One of the participants reporting a decrease in alone time for this purpose also indicated not changing behaviour in going out or meeting with friends prior to performance. This might suggest that the participant decreased alone time to spend time socializing with friends as this helped them relax prior to performance. However, to interpret the nuances of these short and limited free-text responses effectively, further qualitative research is needed to investigate the reasons behind the behaviours engaged in prior to performance. Chapter 4 and 5 will therefore investigate orchestral musicians' perceived functions of pre-performance routines in more depth.

Among the reasons given for decreasing time alone, however, is an involuntary one, as participants pointed to the difficulty in finding a space in which to be alone prior to performance. This suggests that orchestral musicians do not have the necessary space backstage in which to engage in behaviours which they perceive as performance enhancing. This change in behaviour dictated by limited space might be the reason why being alone was the only behaviour which was not grouped under any of the five categories.

It is probable that not being able to find a space in which to be alone effects what behaviours professional orchestral musicians can engage in prior to the performance itself. Meditating, for example, requires a quiet environment devoid of distraction and may prove difficult to accomplish while others engage in going over passages in the music and/or in socializing as they wait to go on stage. It would therefore be interesting to explore what is meant by meditation by those musicians reporting an increase in this behaviour prior to performance. However, considering the possible impact of the environment on behaviour, it would be useful for research concerning interventions on pre-performance behaviours to consider the scenarios musicians play in and to propose suggestions applicable to such scenarios.

It is interesting to note that the aforementioned lack of backstage space and the resulting difficulty in being alone prior to an orchestral performance makes deep breathing/relaxation exercises the easiest behaviour to engage in, as it is a discreet behaviour participants state engaging in especially when trying to cope with performance anxiety. However, not all musicians resort to breathing/relaxation exercises (Physical Readiness) to cope with performance anxiety. Study 1 showed that 19% of participants reported coping with performance anxiety through increasing sedative intake (Substance-intake) when performing in less familiar situations such as playing exposed orchestral sections and solo concerts. The link between orchestral musicians, beta-blocker intake and performance anxiety has long been documented in the literature (e.g. Kenny et al., 2014). Considering these findings and the adverse effects of beta-blockers on general health and performance, future research should continue to invest in an exploration of behaviours and of pre-performance routines as strategies towards managing performance anxiety. More research is therefore required to equip musicians with effective methods for optimising performance while simultaneously enhancing performers' health and wellbeing.

It is interesting to note that the only behaviour for which the majority of participants reported a decrease in, rather than an increase or a no change in behaviour, was drinking alcohol (Distraction Methods). Although some performers reported that the reasons for alcohol consumption were to enhance relaxation, help distract themselves from performance, and help control performance anxiety, the majority of participants reported that they decreased alcohol intake to reduce the chances of impairment and of negative impact on colleagues. This is especially understandable in the orchestral context where performance is a collaborative effort where the actions of one performer affects the whole, and vice-versa. However, participants might have felt compelled to report a decrease in alcohol intake because of the socially accepted norms around drinking. The number of performers who increase their drinking prior to performance might therefore be higher. It is also interesting to note that among the participants indicating an increase in alcohol consumption, one participant stated that they did so as it was the sociable thing to do. Presumably, this might have been in reference to having a drink with friends and/or colleagues prior to performance.

Findings also suggested that the majority of musicians engaging in all the sub-scale behaviours within Physical Readiness also engaged in most or all of the sub-scales within Distraction Methods and within Talking to Other Musicians. Therefore, musicians engaging in behaviours such as in deep breathing/relaxation exercises, meditation and exercise prior to performance are also likely to engage in behaviour in thinking about other things to keep the mind off performance, reading something distracting, drinking alcohol, going out/meeting friends, and talking to one's mentor or co-performers about their performance prior to performance. What this might suggest is that the behaviours within Physical Readiness are the pre-performance behaviours that are the most telling in orchestral musicians. To note is that these behaviours have already been mentioned in the literature concerning music and sport. Meditation and relaxation are among the mental strategies employed by athletes prior to performance (Cotterill, 2014) while breathing techniques, relaxation and physical activity have been mentioned as behavioural strategies adopted as short-term strategies to help alleviate performance anxiety in musicians (Roland, 1994). The sub-scales within Physical Readiness are therefore worth exploring further. This is especially the case for exercise which is the only sub-scale within Physical Readiness which musicians reported as not changing prior to performance.

Results also showed that orchestral musicians engaged in Distraction Methods prior to performance. These methods are also prominent in sport literature concerning interventions designed to alleviate choking in athletes. However, distraction methods in sport revolve around interventions applied during the execution of a skill (Mesagno and Hill, 2013), not prior to performance as in the case of the orchestral musicians in Study 1. Another behaviour which might be peculiar to musicians, and which has not emerged in sport literature so far, is socializing with one own's mentor and co-performers' prior to performance, both sub-scales of Talking with Other Musicians.

In all, these findings suggest that further research is needed to understand the behaviours musicians engage in prior to performance. This is especially true for the sub-scales within Physical Readiness, Distraction Methods and Talking to Other Musicians, with particular reference to the sub-scale of exercise. This is because apart from being the only behaviour within Physical Readiness to have been reported by participants as not changing prior to performance, it carries a lot of weight within this sample of professional orchestral musicians, where 77% of participants engaged in exercise as part of their daily/weekly routine. The importance of physical health and fitness for performing artists has already been documented in the literature (Cahalan & O'Sullivan, 2013). Recent research on the effects of the COVID-19 lockdown on arts professionals (Spiro et al., 2021) has also shown that performing artists engaging in physical exercise prior to and during the pandemic have had less of a steep decline in mental health indicators, further highlighting the importance of physical exercise for art professionals' mental health and wellbeing.

Although the strength of Study 1 is that it is the only research of its kind to directly address pre-performance routines in the music domain, it is also limited due to its relatively small sample size. Among its limitations is not having added more cognitive and performance-related items such as motivational self-talk, visualization, imagery, performance-simulation and mindfulness, to the list of predominant behavioural items in the original Musicians' Pre-Performance Survey. Study 2 addresses this limitation through using semi-structured interviews as this method of data collection elicits information from participants and in this case, allowed them to choose the pre-performance routines they wanted to talk about and elaborate on. In Study 1 participants were also asked to rate each of the behaviours according to whether or not they changed immediately prior to performance. Although the reason behind this was to avoid bias in the wording of the original MPPS, a 4-point Likert scale would have served the purposes of Study 1 better. This highlights the need for future research to create a new scale through which to investigate pre-performance routines in the music domain.

3.6 SUMMARY

To explore professional musicians' behaviour in preparing to perform, Study 1 first identified the onset and duration of the pre-performance period, and then explored behaviours in professional musicians. It also investigated any change in these routines during the pre-performance period and sought to explore the reasons behind musicians' engagement and change in behaviours.

Study 1 showed that the median for the duration of the pre-performance period in professional orchestral musicians was of 180 minutes which is equivalent to 3 hours. The pre-performance period also showed higher rates for periods between 2—30 minutes and 40-60 minutes, and between 2-4 hours and 6 hours, while pre-performance periods under 15 minutes or over 1 week were rare. Despite this median, 26% of musicians reported their pre-performance period as being between 2 to 6 days. Since performances in symphonic/philharmonic orchestras range from one to three times weekly, and up to ten times weekly in pit musicians, this suggests that some orchestral musicians do not get any downtime, with adverse effects on their physical and mental health. Results showed no association between the pre-performance period duration and the variables of age and experience (years spent playing main instrument, number of performances given yearly) suggesting that the pre-performance period is not likely to be a function of exposure to a performance setting. Similarly, no association was found between the pre-performance duration period and engagement in routine prior to performance.

The new conceptual element to emerge was from the factor analytic findings grouping of all behaviours (except for 'being alone') into 5 factors denoting separate categories of pre-performance behaviour: Physical Readiness, Technical Preparation, Substance-intake, Distraction Methods and Talking to Other Musicians. One other finding that emerged from

Study 1 was that most of the pre-performance behaviours engaged in by musicians have already been documented in the literature concerning sport performance, except for Talking to Other Musicians which included behaviours relevant to mentors and co-performers. This may be due to the relevance musicians gave to the interaction with mentors and co-performers during the pre-performance period, already documented in Chapter 4 and 5 of this thesis.

Results showed that with the exception of Substance-intake, most professional orchestral musicians engaged equally highly with the sub-scales within each category of behaviour. Findings also showed a significant difference between Physical Readiness and family of instruments played, with wind and string instrumentalists scoring high in Physical Readiness (deep breathing/relaxation exercises (including stretching), meditation, and exercise) when compared to the rest of the instrument families. Another finding was the significant difference between Talking to Other Musicians and number of yearly performances, with professional orchestral players performing between 50-80 times yearly scoring high in their engagement with the behaviours in Talking to Other Musicians (talking to one's mentor, talking to one's co-performer) when compared to those performing between 25-30 performances yearly. There was also a positive association between gender and instrument family showing that the majority of females played string instruments while males showed an almost equal distribution between playing string and brass instruments. However, there was no significant difference between gender and the total scores in the five factor categories.

One main finding was that overall, the behaviours engaged in by professional orchestral musicians prior to performance in the main, either increased or did not change up to the performance date. More specifically, seven behaviours were reported as not changing, six as increasing, and only one as decreasing (this was drinking alcohol). With regards to behaviours reported as **not changing** prior to performance (in order of importance), these included Distraction Methods (reading something distracting / thinking about other things to keep the mind off performance / going out with friends), Physical Readiness (exercise), Talking to Other Musicians (talking to co-performers / talking to one's teacher/mentor about performance), and Substance Intake (smoking cigarettes). It might be suggested that these are part of a professional orchestral musician's daily/weekly routine and as such are not perceived as having any specific additional impact on a planned performance.

With the exception of exercise, participants did not provide reasons for why they did not change their behaviour prior to performance. Although few responded, reasons given were related to an enhanced sense of calm and to the release of excess energy through exercise. It can be inferred that these are effective for general functioning purposes and may indirectly extend to performance. Consequently, it may be suggested that exercise is part of a professional musician's daily/weekly life with most not engaging in it as a strategy to enhance performance.

Enhancing focus prior to performance was also one of the reasons given by participants for changes in behaviour prior to a performance. Sometimes this led to contrasting behaviours to achieve the same goal. To help cope with performance anxiety, for example, some participants reported increasing the behaviour of going over notes/chords/passages/scores that were not well-prepared, while others decreased this behaviour, and instead increasing going over well-prepared passages. One pre-dominant finding of this research, therefore, was that the perceived functions behaviours fulfil are different across musicians.

With regards to behaviours reported as **increasing** prior to performance these were (in order of importance): Technical Preparation (going over notes/chords/passages/scores which have been well-prepared / going over notes/chords/passages/scores which have not been well-prepared); Physical Readiness (deep breathing and relaxation exercises (including stretching) / meditation; being alone, and Substance-Intake (taking sedatives). Study 1 showed that 19% of professional musicians increased sedative-intake when performing in less familiar situations, such as for exposed solos in an orchestral context. This finding, along with the adverse effects of beta-blockers on performers and performance highlights the importance of research in exploring pre-performance routines that help towards performance optimisation and that simultaneously enhance performers' health and wellbeing.

The only behaviour reported as mostly **decreasing** during the pre-performance period was drinking alcohol (Distraction Methods). This may of course be somewhat unreliable as a socially desirable response. Participants increasing alcohol intake prior to performance reported doing so to enhance relaxation, help distract themselves from performance, and help control performance anxiety. Those reporting a decrease reported doing so to reduce the chances of performance impairment and subsequent negative impact on colleagues.

Another important finding of Study 1 was that as many as 77% of professional orchestral musicians engaged in exercise in their daily/weekly routines. This is in contrast with some of the literature suggesting that musicians' engagement with exercise is limited (Kreutz et al., 2008, 2009; Panebianco-Warrens et al., 2015; Araujo et al., 2017), but is in line with more recent research on music students in higher education who meet general physical recommendations for exercise (Matei & Ginsborg, 2020; Araujo et al., 2020).

A key finding therefore, that physical exercise is part of most professional musicians' daily/weekly routine, and that exercise is reported as not changing prior to performance, indicates that better understanding of the pre-performance routines of professional musicians is needed, hence the design of Study 2.

CHAPTER 4

Performance Strategies and Pre-performance Routines on the Day of Performance

Study 2

4.1 INTRODUCTION

As already discussed in Chapter 1 section 1.2.2, literature in sports and other performing domains exploring performers' thoughts, perceptions, and experience of pre-performance routines through interviews is sparse. In the music domain, few studies exist which explore pre-performance routines in any depth. However, in such research, interviews are used as a valid means of exploring the broad range and practice of performance preparation strategies. As already mentioned in Chapter 1 section 1.2.4, although Roland's 1995 study did not focus on pre-performance routines but on how performers coped with music performance anxiety, semi-structured interviews were employed with 30 successful classical and jazz musicians. Data analysis was carried out using text searches, code and retrieval operations to gather information on a particular issue from all the interview data. In another study focusing on investigating the mental factors relating to musical excellence in elite classical musicians, Talbot-Honeck and Orlick (1998) employed a 25-item open-ended topic guide together with interviews with 16 musicians with national and international performance experience. Transcripts were then analysed to determine common themes and categories.

Holmes (2005) too employed interviews in investigating how the development of instrumental technique impacted musicians' learning and memorization techniques. The semi-structured interviews in this study allowed for participants to elaborate on their ideas and perceptions. Data analysis was then carried out using IPA. The reasons given by Holmes' for the employment of IPA echo Cotterill's (2015) as she states that IPA allowed for considerable flexibility as themes emerged gradually as analysis progressed. Holmes also states that IPA allowed for the exploration of patterns and relationships of themes both individually and between participants. The richness of the results provided by IPA together with the emergence of unexpected themes in her study rendered IPA a sound exploratory method to investigate such topics.

As discussed above, there is no research which focuses on pre-performance routines in the music domain. As interviews are especially useful when little is known about a research topic it was therefore deemed appropriate to use interviews as the best method for data collection to explore RQ3 covered in Study 2 (Chapters 4 and 5). Study 2 therefore builds upon the findings of Study 1 and serves as a follow-up for further interrogation of the findings. The aim of Study 2 was therefore to seek greater detail of the pre-performance routines orchestral musicians adopt prior to performance. It also sought to better understand the complexities behind the functions pre-performance routines are perceived as having on performance. In so doing Study 2 also explored the performance strategies adopted by professional musicians on the day of performance till the onset of the pre-performance period as well as performance strategies and pre-performance routines employed by musicians on the day of optimal and worst performance.

Study 2 is described over Chapters 4 and 5. Chapter 4 addresses the methods used in Study 2 and addresses the first part of RQ3 concerning professional musicians' perception on how pre-performance routines impact performance. It therefore covers the analysis and results concerning performance strategies on the day of performance: (1) on performance day up to the onset of the pre-performance period, (2) during the pre-performance period. Chapter 4 ends with section 4.4 with a discussion of results. Chapter 5 addresses the second part of RQ3 on how professional musicians' perceptions of the effects pre-performance routines have on performance are reflected in the recollections of their optimal and worst performance. A discussion of results follows in section 5.2 and the chapter ends with section 5.3 which concerns a conclusion and implications for future research.

4.2 METHOD

The method of data collection for Study 2 was the interview. As already mentioned in section 2.3.2 interviews are useful for eliciting thought processes and feelings which would otherwise be difficult to observe (Wellington, 2000). They are also the method of choice when a research question such as RQ3 demands detailed and individual understandings from participants and when little is known about the research topic.

4.2.1 Participants

Potential candidates from professional classical orchestras in English-speaking countries were contacted via email and social media with a brief description of the project. Those preferring not to participate were encouraged to pass on the details of the study to potentially interested colleagues and/or friends for a snowballing effect.

Twelve professional orchestral musicians were recruited. Since the greatest percentage of respondents in the first study belonged to the string section of the orchestra, participants for this investigation were restricted to the four string instrument groups: violinists, violists, cellos, and double bassists. An equal number of participants was chosen for all groups.

Table 4.1 provides participants' gender, age, years spent as a professional orchestral player, type of orchestra playing in, playing position, pre-performance period.

Table 4.1 Description of participants according to gender, age, instrument played, years playing as a professional orchestral musician, type of orchestra playing in, playing position and pre-performance period.

Participant	Gender	Age range	Instrument	Years playing	Type or orchestra	Playing position	Pre-performance period
1	F	55+	cello	20+	symphonic/philharmonic	co-principal	2hrs-0.5 days
2	M	24-34	double bass	5-10	symphonic/philharmonic	rank and file	none
3	M	45-54	cello	20+	symphonic/philharmonic	sub-principal	2hrs-0.5 days
4	F	24-34	double bass	-5	symphonic/philharmonic	rank and file	2hrs-0.5 days
5	F	35-44	cello	5-10	pit orchestra	rank and file	20-30 mins
6	M	35-44	viola	20+	pit orchestra	co-principal	-10 mins
7	F	35-44	viola	-5	symphonic/philharmonic	principal	40-60 mins
8	M	24-34	viola	5-10	symphonic/philharmonic	co-principal	2hrs-0.5 days
9	M	35-44	violin	10-20	pit orchestra	co-leader	none
10	M	24-34	double bass	-5	symphonic/philharmonic	rank and file	on stage
11	M	24-34	Violin	-5	symphonic/philharmonic	co-leader	none
12	F	35-44	Violin	20+	symphonic/philharmonic	rank and file	20-30 mins

4.2.2 Methods of data collection

The type of interview used for Study 2 was the semi-structured interview. This type of interview was selected as it provided an outline of, and specific questions relating to, the functions that pre-performance routines are perceived as having on performance while at the same time allowing for a degree of spontaneity during interview. The semi-structured interview was also deemed appropriate as it allowed for an in-depth exploration of orchestral musicians' use of pre-performance routines and the reasons behind these routines. This format also ensured that all participants were given the same opportunity of response with flexibility in the order of the questions asked which allowed for the flow of conversation to be respected. Having an interview guide allowed participants to explore aspects of their experiences which might not have been expected and of which they might not have been aware, uncovering themes not previously explored or developed in the process (Clark, 2010). This format also allowed the interviewer to use further probes to comments where greater depth was necessary and for data to be compared across the different participants. The interview schedule for this investigation addressed RQ3 and can be viewed in Appendix 2.

4.2.3 Procedure

To render the interview schedule suitable to its purpose, it was first piloted with five doctoral students at the Royal College of Music. Based on this and on feedback gathered from the recruits, minor changes were made to the wording of certain questions to enhance their clarity and understanding. The interview schedule (Appendix 2) was then approved by the Conservatoires UK Research Ethics committee.

A time and location for interview was agreed with the twelve participants. All interviews were carried out virtually through either Skype, Zoom or Facebook Messenger. Three days before the scheduled interview, all participants were emailed the Participant Information Sheet and Consent Form (Appendix 2) which they were asked to read, sign, and return prior to interview.

Interviews ranged from 40 to 90 minutes in length and were recorded digitally using an iPhone Xs (2018) and a MacBook Pro (2017). All interviews were transcribed verbatim - two illustrative ones can be found in Appendix 2 - and randomly selected transcripts were then sent to the respective interviewees who were asked to verify content accuracy.

4.2.4 Data analyses

The aim of this study was to explore some of the pre-performance routines professional orchestral musicians engage in and the reasons behind these routines. To this end, the transcripts were analysed using Interpretative Phenomenological Analysis (IPA). According to Smith and Osborne (2008), the objective of IPA is to explore in depth the lived experiences of participants by focusing on the meanings of each individual participant. Smith and Osborne (2008) describe IPA as an interpretative process where the researcher tries to make sense of the participants trying to make sense of their world. Because the researcher in IPA is concerned with the participants' individual perspectives, it is typically conducted with a smaller sample size than that used in thematic analysis (Williamon et al., 2001). For this reason, this investigation explored the individual experiences of 12 professional orchestral musicians.

The procedure developed for this study involved the following steps:

- The transcripts were read multiple times and insights were documented for each one. The words of the individual participants were actively interpreted in the context of the research question.
- Themes were generated capturing the essential quality of each of the individual transcripts.
- Themes were listed chronologically and were organized into clusters made up of sub-themes together with extracts from the individual transcripts.
- Themes for each participant were listed and used to produce a small group of final superordinate themes that represent the full dataset.

The coding and grouping was carried out by hand and no qualitative data analysis software was used at any stage of the analysis, only the use of excel for categorising systematically. Williamon et al. (2021) state that, for quality in IPA, the researcher should aim for sensitivity to context and for rigor in the application of the IPA methodology. As the analysis should be transparent and coherent (Williamon et al., 2021) and a researcher's interpretation should never go beyond what the participants have said (Shaw, 2001), quotes from the transcripts have been included in the following discussions to illustrate the categorisation of the meaning units. Two transcript samples can be viewed in Appendix 2.

Table 4.2 shows the content analysis for Study 2.

Table 4.2 Content analysis for Study 2.

Theme related to Context	Theme related to Timing of Performance Strategies	Theme related to Performance Strategies for Optimal and Worst Performance
Theme 1: Professional musicians' perception of their general physical health and the ways in which they aim to maintain or improve it (Chapter 4, Figure 4.1)	**Theme 2:** Performance strategies on the day of performance (Chapter 4, Figure 4.2)	**Theme 3:** Optimal and worst performances (Chapter 5, Figure 5.1)
Main Sub-themes	**Main Sub-themes**	**Main Sub-themes**
Sub-theme 1: Performance-related reasons for engagement in physical activity and exercise (includes reasons related to physical and mental wellbeing)	*Sub-theme 1:* Performance strategies on the day of performance up to the onset of the pre-performance period (includes technical and musical preparation, physical activity and exercise, diet and rest)	*Sub-theme 1:* Pre-performance period for optimal/worst performance (Chapter 5, Table 5.1)
Sub-theme 2: Non-performance related reasons engagement in physical activity and exercise (includes medical conditions, mental health and wellbeing, self-perception, coping with stress and offsetting of future ailments)	*Sub-theme 2:* Pre-performance routines engaged in during the pre-performance period (includes technical and musical preparation, physical activity and exercise, being alone, socialising with colleagues, instrument warm-up)	*Sub-theme 2:* Technical and musical preparation
		Sub-theme 3: Physical and mental state prior to optimal/worst performance
		Sub-theme 4: Physical and mental state during optimal/worst performance
		Sub-theme 5: Performance strategies to reproduce/help optimal/worst performance

4.3 RESULTS

The results in this section concern the performance strategies engaged in by professional orchestral musicians on the day of performance.

To provide context to the chapter, professional musicians' perception of their general physical health and the ways in which participants aimed to maintain or improve it is presented here preceding results on the performance strategies adopted on the day of performance. A definition of the term "pre-performance period" follows together with participants' views on the onset and duration of this period of time showing that the pre-performance period varied across individuals and performance scenarios. Chapter 4 continues with grouping musicians' performance strategies into general themes according to two different time periods on the day of performance: (1) performance strategies on the day of performance up to the onset of the pre-performance period, (2) pre-performance routines adopted during the pre-performance period (see Figure 4.2 for a diagram of content analysis).

4.3.1 Physical health

Musicians' perception of general physical health ranged from six respondents who reported their health to be good to one respondent who said this was below average. Two participants reported medical health issues while four re-counted playing-related musculoskeletal disorders (PRMDs). One way in which participants achieved and/or maintained good physical health was through regular physical activity and/or physical exercise (10 respondents). However, participants also gave other reasons for their daily engagement in physical activity (PA) and/or physical exercise (PE), this held for ten respondents (See Figure 4.1 for a diagram on content analysis).

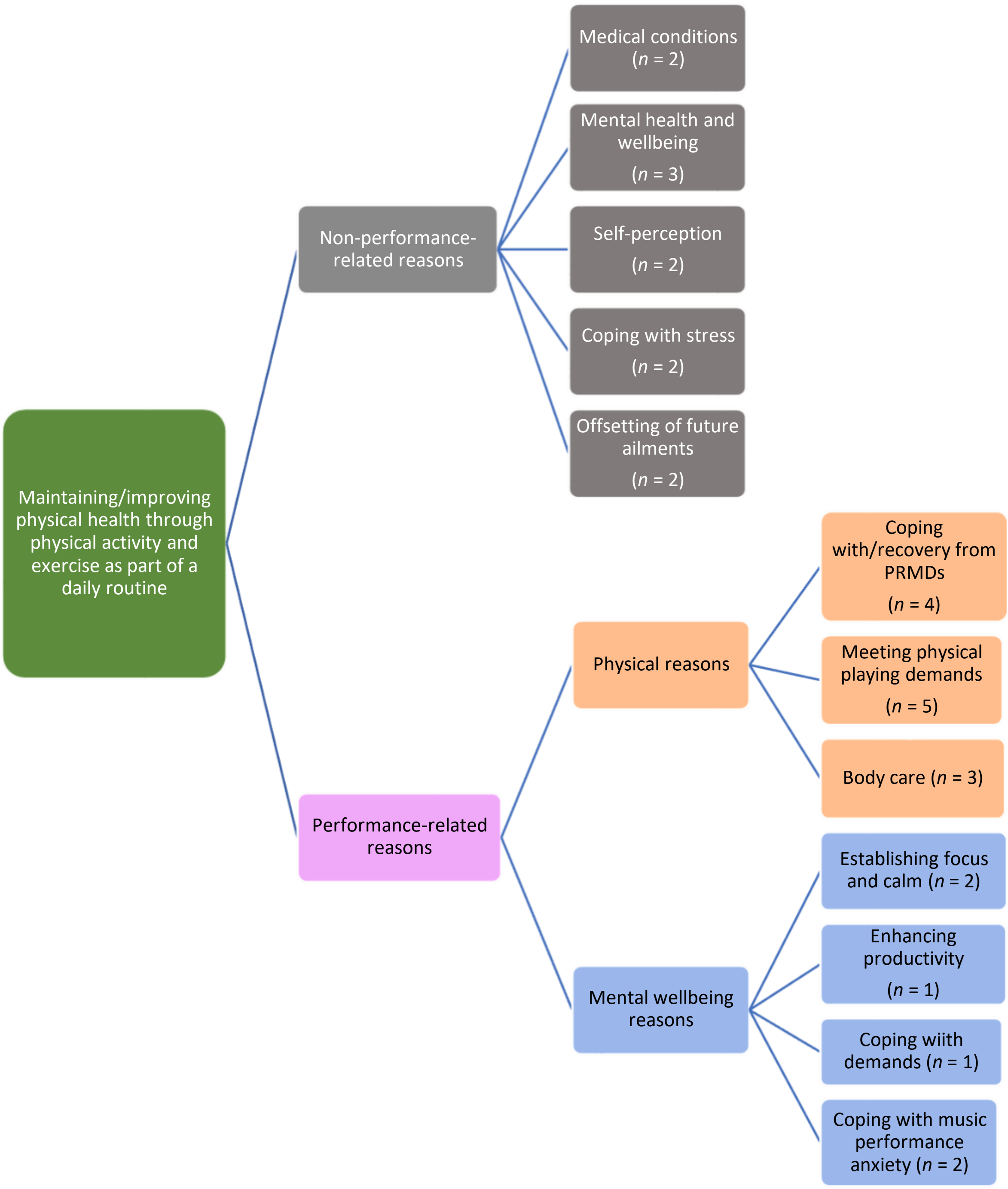

Figure 4.1 Categorizations of interview data themes pertaining to musicians' reasons for maintaining/improving physical health through physical activity and exercise.

Results for the reasons given by musicians for their engagement with physical activity and exercise (PA/PE) have been grouped under two sub-themes: (1) non-performance-related reasons, (2) performance-related reasons.

4.3.1.1 Non-performance-related reasons

Performers mentioned four non-performance-related reasons for engaging in physical activity and exercise. The first of these were underlying medical conditions mentioned by two participants, for example:

> *So I've had a lot of...em...issues over the course of my orchestral career (...) because I have some neurological problems hereditary, so I tend to have this feeling...em...in my arms about too much...ah...compression, including tremolo playing at the tip, for example...um...and second like in general with the arm suspended I've had eh...some, some issues with pinched nerves (...) I do physical, physical work with the therapist every week. We do muscle training and um...resistance training with...um...bands, rubber bands, things like that.* (Participant 9).

Three participants also reported on the benefits of physical activity and exercise on mental health and wellbeing.

> *Eh...I think my...not that I've got any mental health problems, but I think my mental health is better if I just have a little bit of exercise...each week.* (Participant 10).

> *I think just feeling fit and healthy, definitely, definitely helps...um...It just, I mean it helps everything, doesn't it? [Laughs] It is kind of, I think, I think yeah, without I mean, I haven't given it a great deal of thought but I think it's just...feeling good about oneself is, is really important with performing (...) I think generally, feeling good about yourself...um...has a, yeah, it has an influence on things definitely.* (Participant 3).

Besides engaging in PA/PE to maintain mental health and improve positive wellbeing two participants also reported on exercising because it made them feel good.

> *It's the same with exercise where I know that exercise mentally and physically helps me perform well, um...and the reason it does that is because it makes me feel good so...yes, it is for performance, but also it's just because it makes me feel good.* (Participant 2).

Two musicians also stated that PA/PE helped them cope with and alleviate general stress levels.

I probably started exercising...eh...around the time that I quit smoking which was around the time that I started to freelance and do more auditions, and I did find the um...or I do find that exercise...it, it's just kind of destresses me a bit? (Participant 4)

So anything that gets the heart going and kind of releases stress. So running on the treadmill, and um...yeah, rowing machine, things like that, the bikes. Yeah, and I do a bit of weights, but...mainly cardio. (Participant 7).

Another two participants talked about how they engaged in PA/PE to offset future ailments.

Of course, when you, when you get into your 40s you start...thinking about your...ah...you know, perhaps it's more on your mind about your physical fitness and, and, and what lies ahead...um...and I think part of that, as well, for me is, is...preparing myself for, you know, the, the tail end of my career when...I might be more susceptible in having aches and pains and ah...postural problems. (Participant 3).

If I didn't do [physical activity and exercise) I'd probably notice, but…maybe I…it's one of those things where…I suppose the degradation of your own body and physique as you get older…uhm…you're not so aware of what's happening but you just try to offset it in some way. (Participant 12).

4.3.1.2 Performance-related reasons

Performers also engaged in physical activity and exercise for physical and mental reasons related to performance. For this reason, these results have been further sub-divided into (1) physical reasons and (2) mental reasons.

4.3.1.2.1 Physical reasons

Participants reported doing physical activity and exercise for three distinct physical reasons related to performance. The first of these was using PA/PE to cope with, or recover from, PRMDs (n = 4).

When I was younger and...first starting in an orchestra, I didn't have a specific...um... regiment and there were periods with lots of physical...um...exercise, other periods where

I didn't. It wasn't connected to my job. But then after a while, after a number of injuries, I realized that physical fitness was actually quite important for orchestral playing. I began to do to Alexander Technique and a...I began to do um...resistance training, strength training, the internal core, specifically for my lower back because I had lots of back problems. And then those problems seem to weigh over, depending on the production [smiles]. Unfortunately Wagner I'd some other injuries just...holding the violin up for too long, specifically in the shoulder. (Participant 9).

I go twice a week...to a climbing wall...um...and then because the schedule in [X] is a lot less than in [X], so I have more time...um...and swimming I would say, I try and go once every couple of weeks just to...as a recovery kind of exercise because sometimes if I get a sore back or...it seems to help. (Participant 4).

PA/PE was also used by participants to be able to meet the physical demands of performance. This included playing physically demanding and strenuous repertoire, sustaining the weight of one’s instrument, and working towards stamina for long programmes and touring.

I definitely see the importance of staying fit and healthy to be able to sustain the demands of the job, and also the demands of the playing because...also, of course, it's the practice as well, but if you're not physically fit, and if you don't have a good sort of...um...level of fitness, that's sort of for your heart as well. I think that a small problem can become a big problem, bigger problem um...in playing, if you're not physically on top of things. (Participant 1).

I'm probably more mentally than physically, but even...keeping strong, especially the viola is quite heavy...the keeping strong is quite important. (Participant 7).

I think in health of the stamina, again, cause when we do...an opera, ballets, quite long performances as opposed to normal concert so...it's long day so that's definitely helped that...generally just being in a, you know, good shape and...kind of...health. (Participant 5).

Taking care of one’s body to avoid performance-related problems was also among the reasons for performers’ engagement in PA/PE. This included doing PA/PE to help with posture while playing, help release muscle tension and help avoid injury.

> *I found that...um...you know, aside from being...fit, physically fitter um...I found that there were so many knock-on benefits...um...from...exercising more regularly, and in a more, sort of, structured way...ah...and I...sort of, you know, specifically thinking about playing-wise, just sort of...I, I felt that my...posture improved...ah...and I...felt in much better shape, generally and, and I...I felt that that was having a, you know, a knock on effect...um...just from the, you know, to counterbalance...sitting on a chair...um...playing the cello a lot of the time, a lot of, you know, hours on end.* (Participant 3).

> *I'd say yeah, less, less muscle tension, fewer knots in my shoulder and...which...specifically to keep up the violin I sometimes feel. I, I am left-handed so I'm naturally stronger in my left hand, on my left side...so I would feel that [inaudible] bow and specifically when there's many passages on the G string in the upper parts of the bow. And going to the gym certainly helps...the whole feeling of just being relaxed and not having a natural position, gives groundedness.* (Participant 9).

> *Generally just being in a, you know, good shape and...kind of...health having less, well, theoretically less, less injuries and things so...you know, repetitive strain injury so the stronger your muscles are around the joints and ligaments so...the less chance of an injury.* (Participant 5).

4.3.1.2.2 Mental wellbeing reasons

Participants also reported doing physical activity and exercise for four mental wellbeing reasons related to performance. Two participants commented on how PA/PE helped them clear their mind, achieve a sense of calm, and focus on performance.

> *I think there's something um...certainly with running and anything that you do that has a sort of a long focus...that does help you um...focus your mind. Um...yeah, it helps you get in the zone and it's similar...a similar zone to the one you need when you're playing, just kind of...rather than just all these sort of things flying around your head, even if you do have another voice that is just one [laughs], what kind of...this is what you need to do.* (Participant 7).

> *I think [physical activity and exercise...it makes me calmer but I, I do feel like when I've got more clarity of mind, I'm more, I'm more opened...as a player maybe um...but I think it*

leads into all aspects of my life not just...music either, not just playing. I think it...but I think that's what...I think everything's connected anyway in that way so. (Participant 4).

One participant also spoke about how PA/PE helped them be more productive during both practice and performance.

I decided this time that I was preparing for audition that I would cut my practice time into 20 minute slots, and after 20 minutes I would do some form of exercise, it might be 20 push-ups and some sit ups, and then I'll do another 20 minute practice, then I might go for a run for 20 minutes, and then I'll do some more (...) And I found that I made more progress doing that than I ever had before (...) practiced less than ever before, and I was happier than ever before. And so I, when I was playing in the orchestra when I first started with, with my orchestra, there were these times where I started touring and I wasn't exercising and I, I...I figured out, I started running again at night times when I'd get back from rehearsals and I found that helped me feel good the next day. And so that's when I decided that I really needed to make it a part of my process if I wanted to feel good and play my best. (Participant 2).

Another participant reported on how PA/PE helped them cope with the demands of being a performer.

I think the amount I do yoga often correlates with...I find...if I make the time for that, even if we're busy, I'm able to deal with the demands a lot more so I would say that over the years, I've tended to exercise more with the increased demand at work...yeah. (Participant 4).

Participants also reported on how they used PA/PE to help with their music performance anxiety.

I...exercise helps. If I exercise on that day, if I'm feeling like quite anxious, then...I'll go for a run. (Participant 7).

If I feel any nerves, if there's any time when I feel any anxiety, the smallest bit, I usually try and go for a jog. Like even if I'm wearing my performing clothes, and I've got 15 *minutes till I go on, I'll try and get out of the building and go for a quick 2 minute run up and down the street just, and that always helps me, those sorts of things.* (Participant 2).

Participants who reported not doing any PA/PE commented on the importance of physical activity and exercise on general health but recounted that physical and mental fatigue, as well as busy performance schedules left them no time for PA/PE.

So I think [physical activity and/or physical exercise) is very important only because I think physical fitness has to do with basically your general health and your general health has a lot to do with nerves and everything that goes into performance. Yeah I do think it's very important, but I wish I had more time. In [X] our schedules are so busy that sometimes I'm a bit lazy because I'm too tired to work out. (Participant 11).

One of these participants also added that although PA/PE might help performance it was not necessary to perform at one's best since most musicians on top of their game were not particularly healthy.

If you think there is many musicians in the world, many of whom are not very healthy, or not very physically able, and yet, if you looked at someone like Pearlman who, you know, has had polio or whatever um...I don't think anybody would argue that...he hasn't been performing at the top [laughs] or he's um...Or, you know, if someone's...conductors who are morbidly obese who seem to be fine and able to demonstrate huge, great musical ideas or insights, and somehow still...(Participant 8).

The idea that musicians do not need to be fit to perform was also echoed by one participant who engaged in regular PA/PE.

[Physical activity and/or physical exercise] helps everything, doesn't it? [Laughs] It is kind of, I think, I think yeah, without, I mean, I haven't given it a great deal of thought, but I think it's just...feeling good about oneself is, is really important with performing. I mean you don't have to be physically fit to play the cello, it's not, you know, it's not physical in that way. You don't, don't get out of breath playing the cello...um...but I think generally, feeling good about yourself...um...has a, yeah, it has an influence on things, definitely. (Participant 3).

Table 4.3 below provides a detailed account of the type, frequency, and duration of physical activity and exercise carried out by participants. Types of PA/PE span walking, running, swimming, cycling, weightlifting, resistance machines, rock climbing, Tai Chi, Yoga, Pilates and Hiit classes. High frequency PA/PE refers to activities/exercise performed 5 or more times a week; medium frequency to PA/PE performed 3 to 4 times a week, and low frequency for PA/PE performed once or twice a week.

Table 4.3 Description of participants according to gender, age, playing position, type, frequency, and duration of physical activity and exercise.

Participant	Type of PA/PE	Frequency of PA/PE	Duration of PA/PE
1	endurance/cardio, strength	high	30mins-1hr
2	endurance/cardio	high	1hr +
3	endurance/cardio, strength	high	1hr +
4	endurance/cardio, strength, flexibility	high	1hr +
5	endurance/cardio, strength, balance	medium	1hr +
6	endurance/cardio, strength	high	1hr +
7	endurance/cardio, strength	medium	30mins-1hr
8	n/a	n/a	n/a
9	endurance/cardio, strength	medium	30mins-1hr
10	endurance/cardio	medium	10mins-30mins
11	n/a	n/a	n/a
12	flexibility	high	up to 10mins

4.3.2 Performance strategies on the day of performance

The pre-performance period

As already mentioned in Chapter 3, the “pre-performance period” has been defined as the period of time in which a performer engages in task-relevant thoughts and actions leading to a musical performance. This pre-performance period varied among the interviewed participants of Study 2: between half a day and 2 hours prior to performance, 40-60 minutes, 20-30 minutes, less than 10 minutes prior to performance, once on stage, no pre-performance period.

Participants also commented on how their pre-performance period varied depending on performance scenarios. One pit musician reported that while they do not have a pre-performance period when playing for the usual opera or ballet performances, this changes to 40-60 minutes when playing symphonic performances, and to 1-2 hours for solo performances.

I don't know cause...um...If it's a period where I feel relaxed, I don't have any. I just show up. So there's...I'm just always perpetually ready (...) You've got to categorise but um...symphonic I would say 40 minutes? (...) I mean, so certainly for opera, by the time we get to the...usually it's the dress rehearsal. We usually do two public dress rehearsals as performances before the premiere so by the time we've done the first dress rehearsal, I always feel like it's, it's, it's okay, it's ready to go. Symphonic is different because when you do the performance it's, it's often (...) in the afternoon before the performance and (...) even though I've prepared it at home, it's always that feeling that this is what, this is on eggshells (...) If it's a very important event...um...and what type of music I'm playing, solo and...classical...concerts are so different (...) Ah...[and for a solo concerto] let's say that's at soundcheck...so, an hour before. (Participant 9).

This difference in the pre-performance period depending on the performance scenarios was also commented upon by a symphonic orchestral musician whose usual pre-performance period is of between half a day to 2 hours prior to performance: “Um...probably hours, but probably the day of the concert, it feels like it's kind of gearing up towards that.” When performances require the musician to play solo parts, however, pre-performance period is of a week in advance of performance:

Ah...straightaway! [Laughs] As soon as I have the music ah...so that would vary, probably a week before if I'm, if it's a big solo. (Participant 8).

For one participant though, the pre-performance period was not dependent on how anxiety-inducing the performance was but rather on the experience they gained.

I think my concept of pre-performance [period] has evolved over time. I remember when I was a student, which was not a long…I was a student 3, 4 years ago I would get very nervous (...) I think for me I don't, I don't really have this period of pre-performance. I *think maybe my entire life is on a…it's a process…there's no Start! Stop! at least for me. And a lot of times I can just walk on…if someone asks me to walk on stage to perform right now, I would…it feels pretty normal. So we are, I think we're constantly because we're so used to it, um, yeah!* (Participant 11).

Figure 4.2 (on the next page) shows themes according to performance strategies employed on the day of performance: (1) between morning of performance and the onset of the pre-performance period, (2) during the pre-performance period (see Figure 4.2 for a diagram of content analysis).

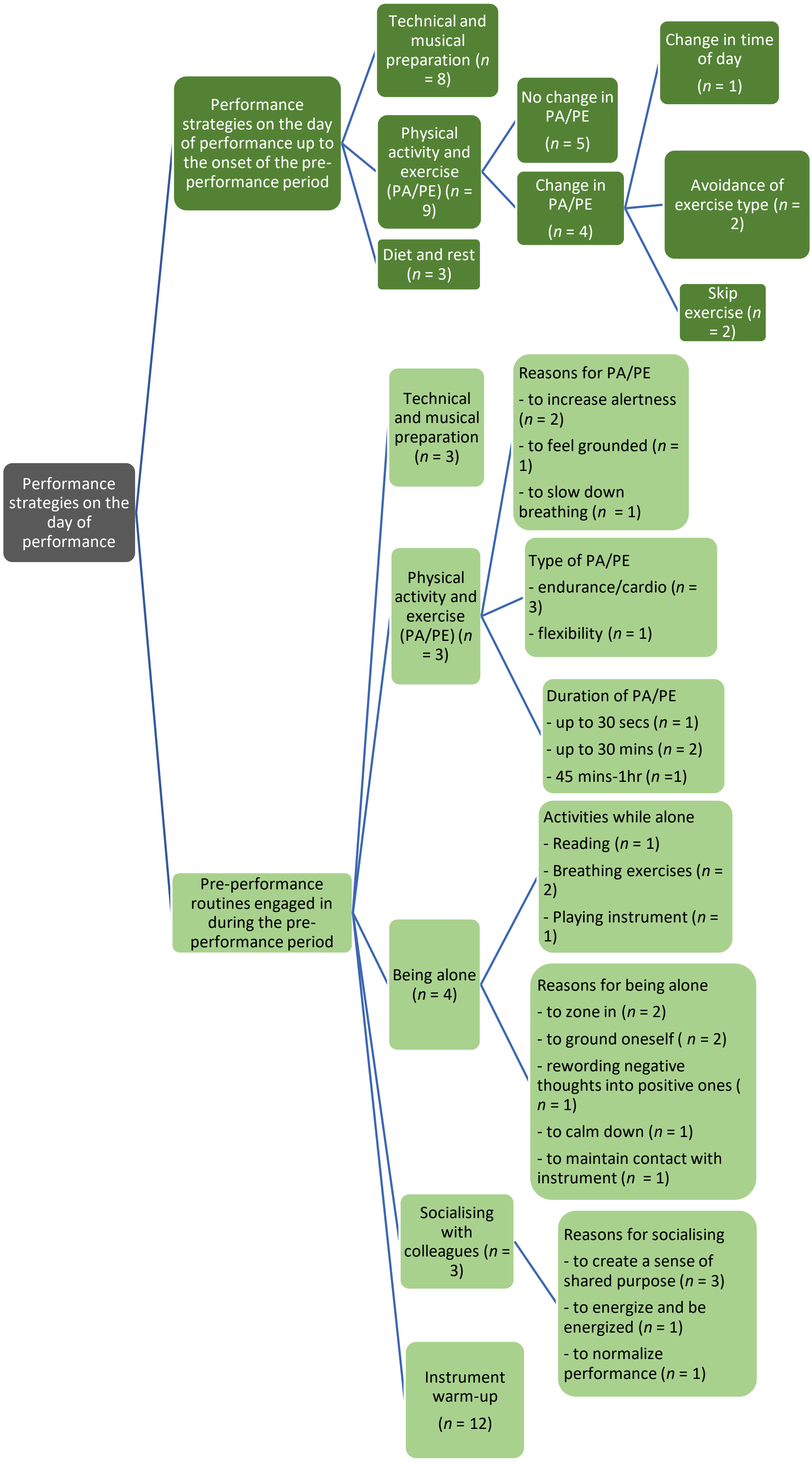

Figure 4.2 Categorizations of interview data themes pertaining to musicians' performance strategies before and during their pre-performance period.

4.3.2.1 Performance strategies on the day of performance up to the onset of the pre-performance period

Results in this section also include three musicians who reported having no pre-performance period.

4.3.2.1.1 Technical and musical preparation

Most of the orchestral musicians in this study talked about how their preparation for performance on the day of the performance itself is set against a backdrop of other professional and personal responsibilities.

> *I would be leaving the house about 8 o'clock so my hour and a half would be, ah, just get up, have a couple of cups of coffee to kind of wake up you know...get a shower, get breakfast, get...prepare some food for the day...ah...for me to take with me. Then I get the train in, walk to the Children's Centre, do my stuff with them, walk over to the concert hall, get to the concert hall about 1 o'clock.* (Participant 3).

> *Ah...well again, depends, if it's, you know, if it's only...if I have something else before or if it's just, just that performance. But obviously I only have a child so I would get up...early because we need to drop her to the nursery, or if it's a weekend, obviously, she gets up early. So there's a lot of, you know, making breakfast and entertaining and things. [Unintelligible] try and fit in some practice on weekdays.* (Participant 5).

These engagements were interspersed with practising sessions for orchestral musicians who either practised at home or at the concert venue prior to rehearsal. Practising at the venue was particularly the case with all double bassists whose instrument is kept at the venue.

> *I'll get into the Hall hopefully by that 9.00 or 9.15, and then I'll do some scales and I'll play some Bach. And I'll...then I might go on stage if it's, if there's, if it's a hard programme, and I'll look at some of the harder bits. Then we rehearse from 10.00 till...um...12.00, um, no, 10.00 till 11.30 sorry, and then we'll go and have a coffee break.* (Participant 2).

The, the problem being a bass player is...eh...you...you not, not necessarily have your instrument at home. So um...I took my bass home last night because...eh...the tour has been cancelled but most of the time my bass stays in the truck. So I, I, I do have a spare bass here...eh...but...currently my desk partner [X] is borrowing my spare bass cause hers has been for repair. (Participant 10).

Practice prior to a musician's pre-performance period, however, was not restricted to the repertoire about to be performed. Besides going over difficult passages in the repertoire, musicians also included practising technical work and preparing for future orchestral, chamber or solo repertoire.

Ah, yeah, it would be a mixture. It would be just...um...you know, practice for the sake of...being in shape, so scales or whatever...um...It might be something to do with it on the day, it might be next week's...ah...performance or if I've got something coming up like a chamber concert then that will, that will be part of it...as well. (Participant 3).

I'll do some scales and I'll play some Bach. And I'll...then I might go on stage if it's, if there's, if it's a hard programme, and I'll look at some of the harder bits. (Participant 2).

4.3.2.1.2 Physical activity and exercise

Of the ten participants engaging in PA/PE as part of their daily routine, nine engaged in PA/PE prior to their pre-performance period. Of these, four participants made changes to their PA/PE on the day of performance.

One participant reported changing the time of day for PA/PE depending on how demanding the repertoire was.

It's dependent (...) specifically...um...strenuous performance things like Wagner, a lot of endurance as is core, we rehearse from 2.00 to 10.00, I would try to go [to the gym] in the morning. (Participant 9).

Two participants reported avoiding certain exercises within their training circuit to avoid injury.

The weights that I do is not something that I do on a, on a...regular, regular basis that's...I'll leave that just so that I'm, I'm not overtaxing my muscles before eh...before a concert or something. (Participant 6).

I am doing them in order but there might be some that I would avoid on a performance day, like, ah...there's the one which is the burpees, where you, you go down on and I sometimes think there might be jarring on the wrist. So either I'm very careful about how to go down, or, or I don't, don't do it. And then ah...then there's also a toning one where you have to pull up, pull a...a plastic band, and so I just wanna be a bit careful about...doing any damage but I don't specifically choose ones um...for a concert day. I just am careful about the ones that I do, do. (Participant 1).

Two participants, however, reported skipping their PA/PE on performance day either because they actively choose not to perform PA/PE on the day to be able to conserve energy for performance or because in an orchestral setting they are not anxious to perform.

Well, because I work, you know, when I'm in the gym I work quite hard, and there's a lot of physical energy so and I need to keep that...for my performance. I just cause of...I just get very tired if I go to the gym and do it in the morning, you know, I get very tired mainly cause, well, it's a lot of energy use, and I have to stay awake and kind of, you know, till quite late. (Participant 5).

So...I don't really, I don't really get that...nervous before going on stage with the [X]. I would [do physical activity and exercise] with audition, which is why I would...I would visit, I would consciously do it when, when I was practising for an audition...um...Yeah, so I think the only, the only deliberate exercise I do before, before an [X] thing is, you know, a technical double bass exercise...just to get my fingers moving. (Participant 10).

4.3.2.1.3 Diet and rest

On the day of performance, one participant reported taking multivitamins to help with energy levels.

I'll usually have some granola and a banana smoothie with blueberries and honey, um...and coffee and a Berocca, and then I go into work (...) It's one of those effervescent *tablets you drop in water, and it fizzes, a multivitamin. System multivitamin gives you a bit of energy.* (Participant 2).

Another two participants reported on their preference for light foods over heavy ones. While one participant commented on choosing foods high in protein, the other reported on the psychosomatic effect that eating a banana had on their performance.

I know for lunch for example I'll always have some...always egg, something proteiny, you know, baked potato [unintelligible]. For dinner I would try and go for something like baked potato with Scottish beef, and a salad. Something similar, but nothing too heavy, nothing fried because just doesn't really agree with me and just gonna sit very heavily. Yeah, nothing too, you know, heavy pudding or anything like that. Again, quite light because very often then, then when I finish I'm quite hungry and I would have a snack as well. (Participant 5).

I always have a banana and I have a [inaudible]...something small, maybe not that it's good to have a banana...I always like to have eaten something before, if it's not the banana like a meal or something (...) I think I'm paranoid...because of the shakiness since I learned early on when I...when I started...having physical problems, that if I had a banana I would, I would feel better and maybe in some ways it became psychosomatic but...um...I feel relaxed to have had one and [laughs] and I go on. I can go on my way of performing without any issues. (Participant 9).

Five performers also recounted sleeping in and taking naps to make sure they were properly rested especially prior to demanding performances.

If it's going to be a long, long concert ideally, I like to have a nap. Now, that was not always the case. That's happened as I got...as I've gotten older. (Participant 9).

4.3.2.2 Pre-performance routines engaged in during the pre-performance period

During the pre-performance period performers engaged in a number of pre-performance routines. [Results in this section exclude musicians who reported having no pre-performance period].

4.3.2.2.1 Technical and musical preparation

A small number of participants reported working on technical and musical preparation during their pre-performance period. As with performers practising prior to their pre-performance period, these musicians reported going over difficult passages in the repertoire to be played on the day and practising repertoire for other performance purposes. All three participants recounted practising in between rehearsal breaks, and between dress rehearsal and before/after lunch.

> *And then at 5.30 I will um...again, I might stay back for 5 or 10 minutes just to look at a couple of bits, and then ah...put it away, forget about it, go and have some tea, probably.* (Participant 1).

> *Again, like in the morning coffee break I tend to just hang around and play some stuff rather than go and have a coffee...um...and then the same again, after the rehearsal is finished, I'll sit around and play on stage for a bit, and then I might um...have lunch, try find a practice room which can be quite hard in [X]...um...if I do find one, great, I might do an hour...of...either...prep for the next, I tend not to practice the stuff for the concert that night...um...I tend to prepare stuff for the next week or, or play my own, like, studies or solo stuff.* (Participant 4).

4.3.2.2.2 Physical activity and exercise

Three participants reported on engaging in PA/PE between dress rehearsal and performance. While one participant would have already done PA/PE prior to their pre-performance period, they would also go for a walk between dress rehearsal and performance.

> *After I've eaten something, if it's, if the weather's fine, might just go for a 20 minute, half an hour walk then, just to get out of the building and then come back and change and...focus on the, on the job.* (Participant 3).

Another participant reported on preferring to sleep in on the day of performance and choosing not to cycle in to work to be able to conserve energy. They would however engage in PA/PE after spending time practising when their dress rehearsal is over. For this participant, the type of PA/PE done during their pre-performance period varied depending on the mindset they wanted to achieve prior to performance.

I might hang around for another 5 or 10 minutes after the rehearsal is finished to look at a few other bits, and then go for a run, and then be back for half past, have a shower, put my blacks on (…) So that's like, that was my routine in [X], and then in [X] it's a bit different because...firstly because the, it's two, it's generally at least two programmes in a week (…) So [X] seems like a...you have to have a very different mindset because you can't be...as...thoroughly prepared in the same way. (Participant 4).

With an orchestra playing one programme per week and repeating two or three concerts of the same programme the participant chose to go for runs to pump some adrenaline and keep alert during performance.

Maybe sometimes going for a run before an orchestral performance does excite my...nervous system a bit more which...is what you need, particularly in [X] when you play, you play in the same concert like two or three times...um...so yeah, probably [laughs]. (Participant 4).

However, with the participants' current orchestra which performs three programs per week, the participant chooses to do yoga instead to calm down breathing and feel more grounded.

I find that if it's something that I find more demanding, either physically or, or mentally in, in...performance, then I need something that makes me feel a lot more grounded (…) If I'm feeling kind of, and I need something to bring me down more down to earth, I tend to favour a long walk or...doing a yoga practice...um...because I find that just gives me...my, it makes my breathing a lot slower. (Participant 4).

Although one of the three participants in this section reported on not having a pre-performance period, they too recounted on engaging in PA/PE in the few minutes prior to performance with the intention of pumping up their adrenaline levels and feel more alert prior to performance.

I'll do push-ups or something like that if I wanted. It depends what sort of a reaction I want to elicit. I mean, sometimes I want to get my heartrate up because I'm too relaxed. I'll do push-ups or do some star jumps or something like that to try and get some energy *going. I mean that's...more for me is that I'm so relaxed, that I could fall asleep, more so than being so nervous that I'm dangling on stage (…) If I can go for a quick, if I can walk outside when it's very cold and go for a, go for a quick walk while it's really cold outside kind of, you know, get my metabolism going [chuckles] or something like that to shock my system? Yeah, those sorts of things.* (Participant 2).

4.3.2.2.3 Being alone

Four participants remarked on actively seeking to spend time alone prior to performance. Although some might be able to find a room to be alone in, others find themselves having to share their space with others, in the green room or otherwise.

There's no space, we're all in it together. So sometimes that's annoying, because some people...will come and chat to me and...I don't always...wanna be chatted to [chuckles]. (Participant 7).

Eh...yeah. I think that's, I think that's...um...part of the...ah...warming up backstage on, on my own. I'm not particularly keen to, to have...chats with people just prior to performance. I, I, I prefer that it's about me sorting myself out, yeah (…) Once I feel comfortable with the instrument then I might have a chat with somebody and then, then go on the platform, but my priority is, is, is, is, is to sit down and, and to make sure that I, I feel good with my instrument. (Participant 3).

For one participant, being alone helps them to turn their negative thoughts into positive ones and in so doing get into the zone for performance.

I will warm up at least 10 minutes before, but I'm probably quite warmed up from the day, but it's just a kind of...is...staying calm and having quiet. That's what I need (…) And it's not, I mean people might talk to me but it's a kind of...my brain is in the zone, getting in the zone (…) change the...um, chang[ing] the manner of [thoughts] so they're not negative. (Participant 7).

4.3.2.2.3.1 Reading

To claim alone time in a crowded environment and to be able to ground themselves, one participant resorts to reading as a means of stopping colleagues from engaging in conversation.

I would say also, I, I think...I don't really like...talking to people a lot if I'm feeling like I need to just...ground myself a bit (…) I've got a couple of books on my phone in the, in the Kindle app or...you know read a book or, or something just to...message my boyfriend or whatever, just yeah…[hesitates]...um...to [laughs] maybe to avoid social interaction? [Laughs heartily] Eh...yeah. I think it helps me perform better yeah...because I, it makes me look a bit more inward instead of…[outward]. (Participant 4).

4.3.2.2.3.2 Breathing exercises

Two participants reported doing breathing exercises during their pre-performance period. For them to be able to do so they need to be alone.

That's why I find that when I do that breathing, I usually try and...somewhere in the corner anyway, with quietness as well, has to be somewhere quiet, so you're kind of undisturbed. (Participant 5).

Breathing exercises helped both participants to calm down and focus on performance.

Well like breathing, you know, just like closing your eyes for you know, for, for a couple of minutes before, and just trying to conserve breathing and just relaxing kind of, and just shutting everything down. That's, that seems to help. Kind of resetting really. (Participant 5).

Sometimes if I'm feeling, um...like my heart is beating a bit too quickly...I will...do a breathing exercise. We breathe in...and count to five, hold your breath and count to seven, and then breathe out and I think count to seven. Something like that, and you do that, um...10 times in a row, and it just calms everything down. (Participant 7).

4.3.2.2.3.3 Connecting with one's instrument

One participant reported that in the time they spend alone they can connect with their instrument and get in the right frame of mind for performance.

Being with the instrument and feeling good, and then you want, you just want to keep that going. You wanna, you wanna keep that going, and if that means you have to stop and hang around for any time...um...then sort of, I feel that I need to, I need to just, I just want to play my instrument beforehand just to confirm...that everything feels okay because it's about, it's about that and then, then that puts me in the right, the right frame of mind for the performance. (Participant 3).

4.3.2.2.4 Socialising with colleagues

Three participants also commented on socialising with colleagues in the minutes prior to performance. Interacting with colleagues enabled one participant to create and feel a sense of shared purpose with the rest of the orchestra.

I would treat life normally I think, in terms of, if you know, often it's very sociable, so people are sitting around before a concert...um...so I would just join in with the conversations (...) I guess, creating a sense of team helps with that, especially in the section. So often I will be talking probably to people I'm with before the concert ah...members of one team or another in terms of whether it's the kind of team across the five desks, or the team of my section, or you know, this kind of thing. So kind of creating...this kind of...I don't know, harmonious [laughs] ah...sense of...purpose? I don't know. I think that, just that kind of feeling connected to people before you go on stage helps. (Participant 8).

This sense of shared purpose where performance was seen as a team effort rather than an individualistic one was also reported on by another two participants.

I think that I often take myself away in the afternoon in between rehearsal and concert, (unintelligible) then go and work, or go home and have a kind of downtime, but then before the concert, I go back, and I try to, and I kind of reiterate. And I think that for me, that's important because when you're on stage in the orchestra you're not there by *yourself. You are responsible for your performance, sure but you're there. Actually you're there as a whole (…) That is actually really important in terms of going on stage as a group...um...it is to have that shared time where everybody's like, "Oh, we're here now to do this".* (Participant 8).

I like being with the other musicians… I, I'm quite a social person… I don't seem…There's a different set of leader personalities. (…) I like being with everybody. I feel like that's what makes a good leader is someone who can relate to everybody, who is in it with everybody…you know, we're not…I don't see myself as anyone more special…we're not more important than any other player…we're just given more responsibility. So before a concert I like to be with everybody - I try not to be in my room. I'll be in like, I'll be in the green room with everybody else. Yeah…I think that works best for me. (Participant 11).

I don't, I don't go in for the whole separate yourself and get yourself into the zone thing, I think. I think everything should be fun. Whenever, whenever I've never seen people that segregate themselves and they want to have a little moment of silence beforehand, I'm sure, I'm sure it works and...fair enough. But for me, it would feel a bit um...a bit like you're taking everything far too seriously. I've, I've I've been taking myself far too seriously before I said, "I need a little moment of silence for this...this concert". Because you know, it's...it's supposed to be, it's supposed to be fun. I'm playing nice music with my friends, so why would I want to move away from my friends just before I'm about to play? (Participant 10).

Socialising with colleagues also enabled one participant to energize and be energized in return.

Sometimes, when you feel like your energy is very low when you get to a concert, I might actually do the opposite...and try to be a bit more...energised and...hyper and...that kind of thing. You know, you know that post-concert feeling of when the concert's gone really well, and everybody's like, really excitable...um...it can be that before a concert, and we will be tired, especially if you're on tour or, you know, or you've had a lot of heavy schedule, or people who are worried about the concert, they're exhausted by the rehearsal...um...so it might be that I...try to kind of...cheer people up a bit more in, in some *situations (…) It's more about...having a laugh or trying to create an environment where...people relax in their kind of more...ah...kind of jokey way, I don't know. So there's a kind of, I think that kind of thing of, if you can get people smiling, people um...engaging in that way, then there tends to be, I think it will [unintelligible] even with like a half smile on your face, that energy is much improved. So I think it's about trying to create that sense.* (Participant 8).

For one participant, socializing with colleagues during the pre-performance period enabled them to distract themselves and normalize the performance.

The orchestra is a group of friends, and...we're always just backstage. We're not, kind of, talking about the technicalities of music. We would be backstage having a laugh...before, beforehand (…)trying to avoid getting to...to the point where you're overthinking and you're not enjoying...eh...Either just drown yourself with mundane thoughts...yeah, what we're gonna do, gonna do later, trying to, try to make the um...actual performance, not the um...not the absolute sole focus...because when, you know, when you're practising, you're playing your best. You're never thinking, "Right. This next 15 minutes is gonna be the best performance of this piece ever". You're thinking, "I'll do a little bit of practise, then I'll have a bit of lunch and then I'll...go to work or something". So I try and, I try and get myself back into the kind of practice room mentality...um...which is, it may be the wrong advice, but that's what I do. (Participant 10).

4.3.2.2.5 Instrument warm-up

While not all participants spent time going over repertoire in their pre-performance period and not all musicians engaged in PA/PE prior to performance, all musicians reported taking a few minutes to unwind, relax and have dinner either with colleagues or at home with their families before getting into their performance clothes and warming-up on their instrument. While some performers have a walk-in and therefore warm-up backstage, others do not and warm-up on their instrument on stage.

And then I try and get back to the venue for around 45 minutes before the concert. And then I get changed, put makeup on (…) I warm up...backstage. (Participant 7).

So then at 5.30, just have a bite to eat and...chat with colleagues, and then...I like to get changed about 7 o'clock, and then I like to do...kind of 10 minutes warming up backstage, and then I like to...I like to have a...5 - 7 minutes or whatever um...in my seat on the platform, just playing, making sure that I feel comfortable in terms of...my chair, and me with the instrument and, and then I'm...I'm ready to go! (Participant 3).

4.4 DISCUSSION

This chapter sought to investigate orchestral musicians' performance strategies in two different time periods on the day of performance: (1) on the day of performance till the onset of the pre-performance period, (2) during the pre-performance period. As background work for these two time periods the chapter also presented results for musicians' perceived physical health, the ways through which they aimed at maintaining and improving it, and performers' onset and duration of the pre-performance period. The results showed variation and idiosyncrasies in musicians' activities and experiences.

Aspects of physical health and physical activity/exercise in professional orchestral musicians

Not surprisingly, when discussing their perception of general physical health, musicians spoke about the presence of PRMDs and how these impacted their health. The prevalence of PRMDs in orchestral musicians has, in fact, already been documented in the literature. In 1988, Middlestadt and Fishbein reported that out of 47 orchestras, 82% of musicians were found to have playing-related health problems. This figure rose to 86% in 1995 (Blum, 1995) and to 89% in 2015 (Steinmetz et al., 2015a, 2015b).

PRMDs have been linked to stressful work environments encouraging longs periods of practice and competition, and to a lack of PA/PE (Ackermann & Adams, 2004; Wu, 2007; Rickert et al., 2014). As in the findings in Study 1, although the bulk of existing research suggests that musicians engage relatively little in health-promoting behaviours such as PA/PE (Kreutz et al., 2008, 2009; Panebianco-Warrens et al., 2015), almost all musicians in Study 2 reported engaging in weekly physical exercise with most exercising for 5 or more times weekly. These findings are in line with more recent research (Matei & Ginsborg, 2020; Araujo et al., 2020) concerning higher education music students where it is suggested that students in conservatoires engage in weekly physical activity, scoring within ranges appropriate for their age on cardiovascular fitness.

The World Health Organisation recommends that adults up to 64 years of age should engage in at least 150 minutes of moderate-intensity aerobic PA/PE per week or 75 minutes of vigorous-intensity PA/PE. It also recommends muscle-strengthening activities two or more days per week (World Health Organization [WHO], 2010). Considering these guidelines, musicians in Study 2 seem to be within and above this range. In fact, results showed that most musicians engaged in a blend of endurance/cardio exercise and strength training 5 or more times a week for a total of 60 minutes or more. Findings also showed that there seems to be no difference in frequency and duration of PA/PE across musicians. Therefore, although participants differed in age, type of orchestra, and playing position, no differences in the frequency and duration of PA/PE were observed between younger and older musicians, or between symphonic/philharmonic and pit orchestras, or between co-principals, co-leaders and rank and file orchestral players. Similarly, no differences were observed between males and females.

Musicians gave various reasons for engaging with PA/PE in their daily routines. Among these were reasons related to medical conditions, some of which were hereditary. In these cases, musicians were advised to engage in PA/PE by their GPs, physiotherapists, and physical therapists. Participants also reported exercising to maintain good mental health and positive wellbeing which is in line with the literature highlighting the importance of PA/PE in enhancing mood, mental health and wellbeing (Klaperski et al., 2019; Biddle & Fox, 2003).

Participants also reported on how engaging with PA/PE gave them a feel-good factor post-exercise. This too is vastly documented in the literature especially with reference to the positive effects of PA/PE on self-esteem and self-perception (Fox, 1997, 2000). Further to this, participants commented on how PA/PE helped them cope with general stress and anxiety. General stressors faced by musicians in this study revolved around relationships, childbearing, house chores and work for females, while stressors in males were limited to work. Evidence of how PA/PE helps in coping with stress can be found across the literature (Kim & McKenzie, 2014; Edwards, 2016).

Last but not least, musicians also reported using PA/PE as a means of offsetting future ailments in the hopes of being able to enjoy their lives and sustain their careers for as long as possible. This reasoning was prevalent in two of the participants in this study who were among the eldest in the sample, both over 45 years of age. Both musicians commented on having/having had PRMDs with one participant recounting how a career-threatening injury had forced them into a long break, leaving them with the uncertainty of whether they would be able to continue to perform. This past experience, coupled with the recognition that they were not getting any younger, might have been the reason behind their engagement with PA/PE as PA/PE improves muscle tone and reduces injury (Bejjani et al., 1996; Frederickson, 2002).

Results also showed that musicians engaged in PA/PE to meet the physical demands of playing. This was particularly the case with pit musicians who highlighted the duration of performances as one of the reasons why building stamina was important to them. Pit musicians also viewed stamina as one of the factors helping them sustain the frequency of playing long performances. Double bassists too shared the belief that stamina was an important element when playing. Due to the sheer size of the instrument, double bassists reported playing as being very physical, requiring both stamina and strength.

It is interesting to note how in comparison with this group of musicians, musicians playing smaller instruments commented on how one did not need to be physically fit to perform. This especially in the light of literature showing that the cardiac demand of orchestral musicians is much greater than would be expected from sedentary activity. In a study by Inesta et al. (2008), heart rate values during performance of orchestral musicians were found to be between moderate and heavy levels of work intensity, averaging 115bpm during rehearsal and increasing to 137bpm during concert. The implication of this is that one needs to be physically fit to perform. It is important, therefore, that institutions create awareness around the importance of physical fitness and performance as education plays a crucial role in disseminating knowledge to its students and in ensuring that upcoming musicians observe healthy lifestyles and adopt healthy measures which will allow them to sustain a career in performance.

Participants in Study 2 also noted how PA/PE helped with playing posture. Playing posture is a risk factor reported to be associated with PRMDs (Nyman et al., 2007; Cruder et al., 2017). It therefore comes as no surprise that participants in Study 2 suffering from PRMDs and engaging in PA/PE reported a subsequent improvement in posture.

While some participants commented on how PA/PE helped them focus during practice, one musician recounted how in preparation to auditions they divided practice sessions in 20-minute slots and exercised in-between to enhance productivity. This is in line with research suggesting that PA/PE enhances speed and capacity to process information (Boutcher, 2000). This enhanced productivity and focus might be the reason why the same participant reported on how PA/PE helped them cope with the demands of the job.

PA/PE was also reported to be a strategy for music performance anxiety. Considering the calming effect of exercise reported by some participants, this might have been the reason behind participants' engagement in PA/PE in anxiety-inducing scenarios. It is interesting to note, however, that on the day of performance, while some musicians exercised to help with music performance anxiety, others did not, preferring other activities.

Duration of the pre-performance period

Study 1 showed no significant difference between the pre-performance period and gender. However, female musicians in Study 2 reported the longest pre-performance periods while those reporting on having no pre-performance period were all males aged between 24-44. Results in Study 1 also showed no correlation between the pre-performance period and variables for musical experience. However, while there is research (Steptoe et al., 1995) reporting no association between age, experience and performance anxiety, other studies exist reporting a negative association (Lehrer, 1981; Steptoe & Fidler, 1987). For this reason it was expected that in Study 2, musicians holding positions of responsibility within the orchestra, such as co-principals and co-leaders, would report a longer pre-performance period. The same expectation was held for musicians of lesser experience in an orchestral setting. However, no such differences were observed.

Findings from Study 2, however, showed that a relationship may exist between the pre-performance period and the type of orchestra played in. Although the pre-performance period is highly individualistic, musicians working in pit orchestras had among the shortest pre-performance periods. In Study 2, the pre-performance period of pit musicians spanned a maximum of 30 minutes as opposed to symphonic/philharmonic orchestral members whose pre-performance period could be as long as half a day. A reason for this difference might be due to pit musicians performing in a less anxiety-inducing scenario than symphonic/philharmonic musicians as for the most part, pit musicians play in accompaniment to operatic or ballet companies and are therefore not the focus of performance. Playing in the pit, removed and hidden from the audience might also help musicians feel less anxious about performance as they are also able to move around if necessary.

Another reason why pit musicians in this study may have shorter pre-performance periods might be due to the greater number of rehearsals prior to performance. While symphonic/philharmonic orchestras have two or three rehearsals per programme which are then performed only once or twice, pit orchestras have more rehearsal time, at least two dress rehearsals and the programme is generally played up to 10 times in a week. It was expected that because pit musicians have longer rehearsals and performances than symphonic/philharmonic orchestras, differences would result in the type, frequency and duration of PA/PE between orchestral musicians in the two types of orchestras. This mainly due to the stamina required of pit musicians performing between 2.5 to 3 hours 10 times weekly, requiring greater stamina than symphonic/philharmonic musicians performing for 1.5 to 2 hours 3 times weekly. However, no such differences were observed.

Findings in Study 2 suggest that the pre-performance period may be dependent on how anxiety-inducing a performance scenario is perceived to be. This finding had already emerged in Study 1 and is confirmed in Study 2 by participants talking about a longer pre-performance period for performances which required them to play solo parts, or for those they were less accustomed to playing in. In the case of pit musicians, such performances included playing occasional symphonic works. This is because unlike the bulk of the genre usually played, symphonic work is allotted less rehearsal time and is performed only once or twice during the week. This kind of performance scenario also requires musicians to change the environment they are used to playing in by stepping out of the pit and onto the main stage. Playing in front of an audience, in addition to being unaccustomed to feeling restricted in movement while playing might have an impact on musicians' anxiety and pre-performance period.

The link between the pre-performance period and musicians' anxiety also includes symphonic/philharmonic orchestral musicians when required to perform solo parts in orchestral excerpts, play occasional chamber music, and/or perform as soloists. However, not all solo and chamber performances are seen as anxiety-inducing scenarios. As one participant reported, performing as a soloist was their preferred mode of playing. This, therefore, allowed them to feel more relaxed during solo performances than in orchestral performances as in the latter they always feel less in control of their playing as they need to be mindful of the leader's tune and of that of others while making music.

If playing solo parts is reported as anxiety-inducing by some of the string instrumentalists in Study 2, it would be interesting to investigate anxiety levels and the duration of the pre-performance period in other instrumental groups such as wind and brass. This is because orchestras require a smaller number of these instrument groups as compared to strings, and therefore any individual mistake carries more responsibility. This, together with the frequency with which such sections are required to play solo parts, (which is higher than that required of the strings section), may impact anxiety levels across instrumental groups in orchestral playing.

Considering the reported variation in individuals' pre-performance period and how it seems to be impacted by how anxiety-inducing a performance scenario is perceived to be, future research could invest in measuring individuals' anxiety levels in different performance scenarios, as well as the onset and duration of individuals' pre-performance period when planning intervention studies to help alleviate debilitating performance anxiety and optimise performance.

Performance strategies on the day of performance up to the onset of the pre-performance period

Results for performance strategies engaged in on the day of performance up to the onset of the pre-performance period showed that participants engaged in three main activities, the first of which was technical and musical preparation of repertoire. Such preparation, however, was not restricted to repertoire performed on the day. Many musicians referred to using this time to also go over technical work which helped them maintain a good general level of skill. Along with this, participants practised other repertoire such as that required for upcoming orchestral programs or other performances.

Participants also reported either engaging in PA/PE, or avoiding certain types of exercise, or skipping exercise altogether before performance. The types of exercise avoided included weightlifting and other exercises viewed as causing strain to the wrists, so as to avoid injury prior to performance. The third activity engaged in in this period was sleeping in or taking a nap at some point during the day. The importance of sleep has been highlighted in the literature in relation to optimal mental function, muscle repair and injury prevention (Kyriacou & Hastings, 2010; Huang & Ihm, 2021).

Pre-performance routines during the pre-performance period

During the pre-performance period participants reported going over technical work such as scales and preferred pieces. This accounted for the 76% of participants in Study 1 who reported increasing going over notes/chords/passages which have been well-prepared. Although a few musicians remarked that they did not like going over difficult passages too close to performance, several musicians reported engaging in this behaviour. This too is in line with results from Study 1 where 58% of participants reported increasing going over notes/chords/passages which have not been well-prepared.

Besides technical and musical preparation, participants also indicated engaging in PA/PE. This explains the 50% of participants reporting not changing PA/PE in Study 1. No matter how full one's schedule seemed to be, for example, one participant still found time to rush to a yoga class in between the dress rehearsal and performance. Other participants commented on going for walks and runs alone or with colleagues during this time. Many explained how they brought their running gear along with them to the concert hall and then changed prior to performance. It would be good practice, therefore, if orchestral bodies and performance spaces provided adequate spaces for musicians to shower and change after exercise.

The reasons participants gave for PA/PE as a pre-performance routine were psychological in nature. Symphonic/philharmonic musicians referred to the high turnover of performances which made it very difficult to get to know repertoire inside out. Because of this, one participant explained how they needed heightened focus during both rehearsals and performance to be able to deliver. Participants also talked about their touring schedules and how their repeat performances affected the freshness and enthusiasm for performance. These reasons might explain why participants reported engaging in exercise with a view of enhancing alertness.

As mentioned above, some participants engaged in PA/PE on before the onset of the pre-performance period for its calming effect. This could again be seen in participants' responses to PA/PE during the pre-performance period as they mentioned the benefits that PA/PE had on slowing down breathing and on enhancing feelings of grounding.

Some participants also recounted how their pre-performance routine included being alone. This result confirmed the reported increase in alone time by 50% of participants in Study 1. In Study 2, the reasons participants gave for wanting to be alone included wanting to keep in physical contact with the instrument, a behaviour which automatically isolated them from their colleagues as they would need to concentrate on playing. It is important to note that for double bass players waiting in the green room needing to connect with their instrument in this way and not being able to do so due to their instrument being already on stage, this might cause difficulties. Participants also reported seeking to be alone to be able to focus on performance and to engage in breathing exercises. This is consistent with results in Study 1 in which 49% of participants reported increasing deep breathing/relaxation exercises (including stretching).

Although participants talked about deep breathing exercises as a pre-performance routine to help alleviate performance anxiety it seems that most were not clear about operationalising it. One participant, for example, interchanged breathing exercises with meditation. Another described meditation as a matter of closing one's eyes and emptying one's mind, and their response as to how they would achieve this was vague and unclear. The same was also true for other strategies used by participants to help alleviate anxiety during performance. These included imagery and distraction strategies such as focusing on specific colours within the audience. It is unclear whether participants mentioned these strategies in the hopes of showing they were well-equipped to deal with performance, but such vagueness in performance strategies has also been documented in the literature. Hays (2002) states that musicians might have heard of such strategies but not learnt how to use them, or might have learnt them ineffectively, or might not have truly understood their applicability or utility.

One finding in Study 2 which is consistent with findings in Study 1 is that while some performers actively sought to be alone prior to performance, others actively looked to socialise with co-performers. Some participants reported on feeling the need to connect with other musicians to derive energy from one another prior to performance. What is interesting to note in Study 2 is that while those seeking to be alone were females, all participants wanting to connect with others were males. In giving reasons for wanting to connect with their co-performers prior to performance, participants talked about orchestral playing as a team effort and that as one participant explained, it would therefore make little sense to isolate oneself when they were all in it together.

CHAPTER 5

Performance Strategies and Pre-Performance Routines on the Day of Optimal/Worst Performance

Study 2

5.1 RESULTS

The results within this chapter concern the second part of RQ3 on how professional musicians' perceptions of the effects pre-performance routines have on performance are reflected in the recollections of their optimal and worst performance. Chapter 5 therefore concerns itself with first presenting results regarding the pre-performance period for normal, optimal and worst performance (see Table 5.1). It then presents results for technical and musical preparation, and musicians' physical and mental states prior to and during both optimal and worst performance. Results also include professional musicians' performance strategies to help replicate optimal performances and help avoid bad ones (see Figure 5.1 for a diagram of content analysis).

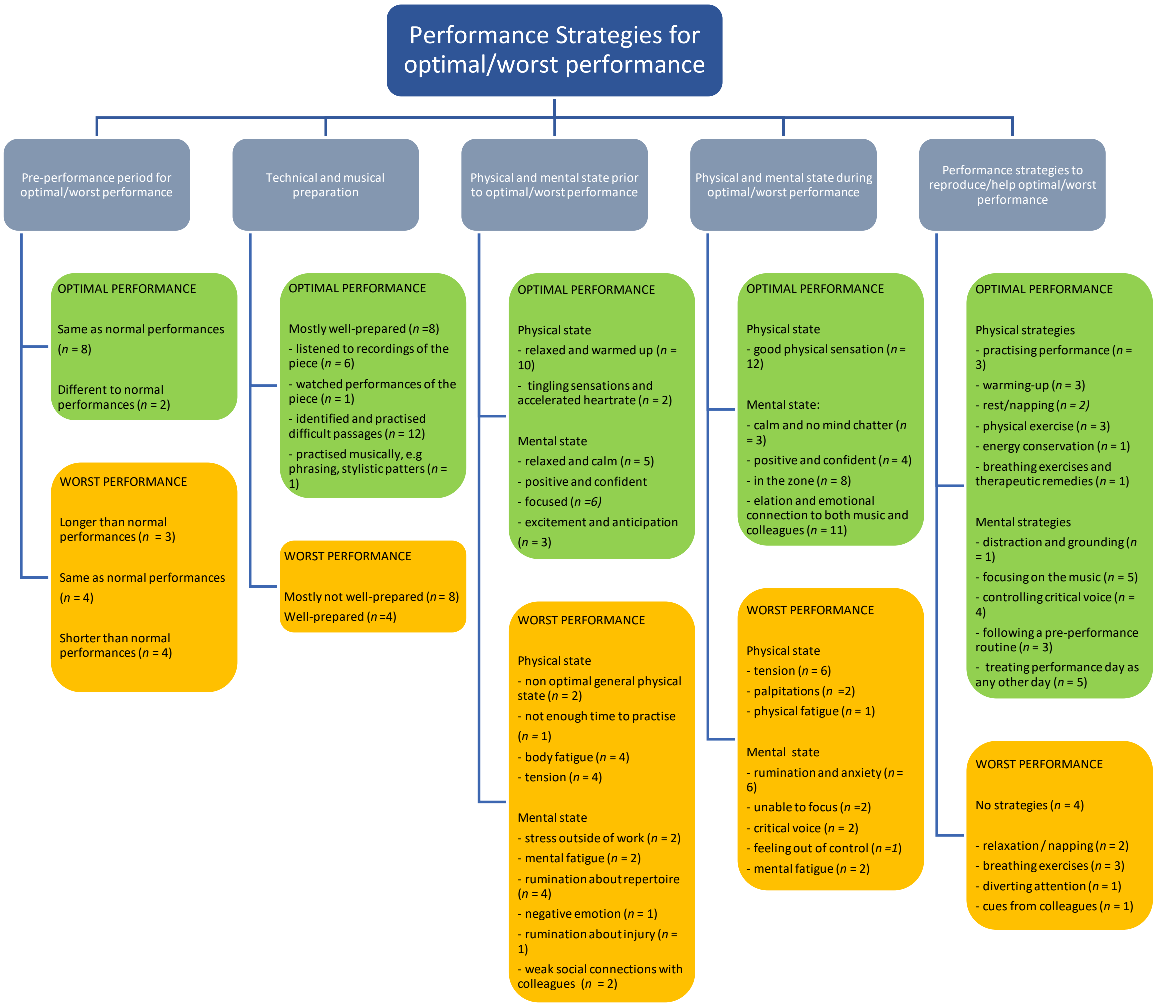

Figure 5.1 Categorizations of interview data themes pertaining to musicians' performance strategies for optimal and worst performances.

For a description of the duration of the pre-performance periods for normal, optimal and worst performances, see Table 5.1.

Table 5.1 Description of participants' pre-performance periods for normal, optimal and worst performances

Participant	Gender	Type or orchestra	Pre-performance period for normal performances	Pre-performance period for optimal performance	Pre-performance period for worst Performance
1	F	philharmonic/ symphonic	2hrs-0.5 days	2hrs-0.5 days	From 1st rehearsal
2	M	philharmonic/ symphonic	none	none	none
3	M	philharmonic/ symphonic	2hrs-0.5 days	From 1st rehearsal	none
4	F	philharmonic/ symphonic	2hrs-0.5 days	10 mins prior	30 mins
5	F	pit orchestra	20-30 mins	20-30 mins	From 1st rehearsal
6	M	pit orchestra	-10 mins	n/a	before difficult passages
7	F	philharmonic/ symphonic	40-60 mins	40-60 mins	40-60 mins
8	M	philharmonic/ symphonic	2hrs-0.5 days	n/a	on stage
9	M	pit orchestra	none	none	n/a
10	M	philharmonic/ symphonic	on stage	on stage	on stage
11	M	philharmonic/ symphonic	none	none	none
12	F	philharmonic/ symphonic	20-30 mins	20-30 mins	40-60 mins

5.1.1 Optimal performance

5.1.1.1 Pre-performance period and frequency of optimal performances

Most musicians reported the same duration of the pre-performance period between normal and optimal performance. Most also recounted frequent occurrences of optimal performance during their professional orchestral career. One participant spoke of optimal performance happening "probably (…) 80%...quite a lot of the time...um...in the orchestra" (Participant 1). Another indicated that it happened "in general, yeah, 70% of the time, I'm, I'm really happy with…the way things have gone or, you know, so it's…yeah, it's, it's quite high, it’s quite high for me.” (Participant 12).

For two of the orchestral musicians, optimal performance occurred in direct proportion to the number of performances given. One participant reported that optimal performance happened “more and more” as time went by (Participant 9) while another noted that “the more you [perform], the easier it becomes to have, have a good, have a good day.” (Participant 10).

Participants (*n* = 3) also commented on how their optimal performance was cyclical.

> *I think it happens about once every two...ah...I'll say once every three weeks, I think that happens.* (Participant 2).

> *I always think of it as a cycle. So I've gone...it's always by periods. If, if I have a difficult period, it'll last anywhere from a couple of weeks to a couple months and then it goes away*. (Participant 9).

One participant commented on how their optimal performance happened only after a series of good performances.

> *I always struggle after...the Christmas holidays or summer holidays because I might have had a week of doing nothing, eh...and then going straight back into work...it's um...it's much easier to, it's much easier to have, to have a good day if you've had a run of...good days...um...especially this Christmas ‘cause I was, I was really poorly.* (Participant 10).

Other participants (*n* = 4) recounted on how conductors, colleagues, stand partners and repertoire impacted positively on performance.

> *Um…no…It just doesn't happen always because I think it depends on the repertoire and the conductor...and the players that are, that are on that day...um...so... all right, I don't know, if there's two concerts a week for a month, it might happen in...I don't know...three times...no, maybe twice that month but it really, really depends on the repertoire and who I'm sat next to...for me.* (Participant 4).

Actually [optimal performance happens] quite a lot of the time. Again, of course, the...opera has orchestra just incredible. When you have all, everyone really cares about what you do, and this really passes on to you so...I think all this people sending, you know, good vibes...makes you kind of...play you know, try and do your best. (Participant 5).

Oh, yes. Yeah, yeah, absolutely. Most of them. Most of them, I'd say (...) When I feel like I'm part, I'm really part of something special, and I'm, I'm involved with people who are really trying to make something special...um...and I felt like that all the time, obviously, in [x]. There's ah...every time that orchestra goes on stage, everybody is trying to, to really be, you know...special. (Participant 6).

But for a few participants (*n* = 2) optimal performance was either infrequent or very rare. One participant reported that optimal performance happened “probably...probably 5% of all concerts I've ever done [laughs embarrassingly]” (Participant 8). Another orchestral musician noted that:

No, I wouldn't say that there's been a particular performance that sticks. Of course there's been some, some good performances. I'm sure from the audience, that sounds absolutely, absolutely fine...um...but there's never been something that I really go “Oh, yeah! I'm very happy to be proud of, to, to be part of this”. (Participant 6).

5.1.1.2 Technical and musical preparation

Most performers (*n* = 8) reported that on the day of optimal performance they prepared both technically and musically and felt “incredibly prepared” (Participant 9) or “pretty much” (Participant 7) prepared.

It's a piece that I know really, really, well, and I did a lot of preparation because I wanted, not just because I was sitting on the front desk, I mean I would do the preparation anyway, but I...it was just a sort of personal thing. I really wanted to...ah...do it justice, do the piece of music justice...um...and be really on top of it so that I didn't have to...think about anything when I was doing it...um...so I wasn't having to, you know, I knew where the entries were, I knew...everything ah...inside out and back to front. (Participant 3).

Participants (n = 8) who commented on having practised outside of rehearsal hours pointed out several strategies in their performance preparation. Six participants reported to listening to the same recording or to different recordings of the pieces to be performed, identifying difficult passages as they went along.

I usually like to listen through the entire piece once with the music. So I listen to it, mark down anything that could be tricky, and then just take a look at those spots. (Participant 11).

Um...I listen to at least four or five different recordings of it. I, ah...at least once read through the score from start to end, while listening to the piece (…) I listened through the piece reading the double bass part, um...and I iden..., I identified some hard bits. And after the first couple of days of rehearsals when I realised there were parts, in terms of ensemble that I couldn't figure out, I went back to the score and looked at them, listening to a recording to try and decode what was going on in those places. That was it. (Participant 2).

I will, I will take the music out. I usually take the music out the week before and um...have a look at certain sections um...ah...just remind myself how, how it goes about fingering, and so it's all a technical preparation. I don't...(hesitates), well, I will listen to it if I don't know it. I don't bother, I don't usually listen to it if I already know it. (Participant 1).

One participant reported watching recordings of the pieces to be played.

I watched the [X] Digital Concert Hall with....ah...I forget who, maybe it's Mariss Jansons or something like that, conducting it, and I watched that. (Participant 2).

Whether or not participants listened to or watched recordings of the repertoire, all recalled identifying and tackling the most difficult passages.

I just make a little note in the part of things I want to, want to look at. So when I've got a spare 5 minutes I can just, I have it all on my iPad or on my phone, and when I've got a *spare 5 minutes I'll just put that out there, have a look at these 10 bars or something.* (Participant 10).

I'll take sections that look the most difficult...um...and start with those and just focus on...finding a fingering that I feel comfortable with, that I don't have to write in (...) Yeah, so just focus on the more difficult bits and often I probably, through time will just leave other bits and just...think they'll just happen in rehearsal. (Participant 7).

Besides paying attention to the technical aspect, one orchestral musician also reported working on musicality, including stylistic patterns, and phrasing.

I guess it starts in a very kind of musical [unintelligible] sense of what's appropriate, in terms of technically and musically, whether that's, you know, Bruckner or Mozart, and...um...what kind of...um...stylistic considerations you should make...um...and then from there I would...I would probably start with just looking for harder passages that I would want to find out about...um...but then I would also think about how I wanted to structure the phrasing and...um...who I was playing that particular line with or what I needed to be aware of elsewhere in the orchestra. (Participant 8).

Such thorough preparation of the repertoire, however, was mostly due to either a good number of orchestral rehearsals, to repetition of orchestral repertoire, or to a preparation of orchestral pieces prepared at a time prior to joining a professional orchestra.

Well, yes, we rehearsed it. I prepared before we started rehearsing it, obviously. So I knew it myself well, and then we rehearsed it lots of times so... nothing we played a few times, and it's about, there was 7 rounds or something so you know, you know the piece pretty well by then (...) No, I think we have played it. I think this...was one of the runs, maybe 4th or 5th. (Participant 5).

Very much so now. I mean, with the...the way that we generally rehearse by the time we get to the performance, we've done it so many times with the singers...not rehearsing for us but rehearsing for them really and for the staging and everything. (Participant 9).
Oh, it would, it would have been, it would have been drilled into me from...Day 1 at [X] really. (Participant 10).

However, participants (*n* = 4) also reported that their optimal performance occurred when their technical and musical preparation was not complete. This was due to the high number of performances within that season.

> *When you play in orchestra, you don't learn...a piece in the same way that you learn a solo piece or a chamber music piece. And so, a lot of it is, you know, it's not...going to be a 100% if you're playing all on your own, wouldn't be 100% of what you'd have, how you'd want to play it, so you have to...put up with some bits that...ah...are a little bit flawed.* (Participant 1).

> *I had never done Mahler's 2nd symphony before. That was the first time I was playing it. [X] musicians…it might be the same in [X] but at least our rehearsal time is very short, in terms of what we have to prepare, so, every time we go into a concert there is an aspect of…we need to focus 'cause we might not know this a 100%.* (Participant 11).

Two participants, in fact, spoke about how their optimal performance occurred in an instance when their preparation was only halfway.

> *Um, I'd played it before I think but I...it wasn't, it was still I guess, a relatively new piece to me, so it was still, it still had that amazing...um...effect that with it's not like I played it a 100 times like some people in the orchestra may have done or...um...so it still felt fresh (…) Probably like...probably 50% but I wasn't thinking...it happens to be a programme that doesn't require more so...it's not the same as playing...um...something like a Nielsen symphony that's incredibly difficult and also not very well known.* (Participant 8).

> *So I would say I personally was about maybe 50% prepared as is nowhere where I would like to be but I was maybe around 50%. But, you know, normal concerts, especially the [X], 50% is pretty normal*. (Participant 11).

One participant also reported optimal performance while heavily relying on sight-reading skills.

> *I um...I wouldn't have had time to practice it. Like I said, I mean, we, so we had, just the night before we had the Mahler performance. I had played Alpine Symphony before, but*

only on the first violin...um...and I would say at that stage, I mean, I very rarely practised for things um...I relied heavily on my...eh...on my sight-reading as, as most people in the orchestra do just because the repertoire is, is turning over so quickly. There's, there's...physically almost no time to practice the next stuff unless...unless it's something you really don't know, then you, then you have to find the time somewhere..um...But I kind of, I knew the piece um...having played it before on first violin and I guess um...in the first rehearsal...you, like I say, you rely a lot on your, on your sight-reading and your ability to play the music without interfering, you know, if you're not playing 100% on first reading, then at least you know how not to interfere with what's going on around. (Participant 6).

5.1.1.3 Physical and mental states prior to optimal performance

Physical state

Asked about their physical state during their pre-performance period, most orchestral musicians (*n* = 10) talked about feeling relaxed and warmed up on their instrument.

I think...relaxed (…) chilled, not probably...physically stressed at all. I probably...sometimes I would come home before this particular time...um...no, I probably stayed in and practised in the afternoon. So I was probably...quite loose from having done that um...so yeah, I'd say probably quite loose and quite relaxed physically, not too strenuous, anything like that. (Participant 8).

I probably would have warmed up for that concert because… it was a really big play right from the start with loads of notes so would've (…) I sort of ran through…a bit, a bit of passage work, some scales just because you know, (inaudible) massive amount playing straight away and it's kinda better to have…feel slightly warm before you get out to the stage. (Participant 12).

Two of the musicians, however, related feeling tingling sensations in their chest as well as an accelerated heartrate prior to their optimal performance.

I get, from anxiety, like tingling in my chest (…) A funny feeling in my chest. That's the only physical...attribute I can, I can think of really. (Participant 4).

My heart rate's gone up and...you can feel a little bit, little bit tingly, really excited about performance but also a little bit nervous (...) it feels a bit like when you've, you've gone for a run, or you've done some exercise, and then you, you stop, you sit down and think, "Ah that was a good run", but then you've got this kind of, you know, the energy rushing around you...um...eh...your pulse is quite high, your breathing can be, can be a bit um...eh...I don't know, don't really know how to describe the feeling actually...it's moving a bit fast, you have to slow yourself down a little bit. (Participant 10).

Mental state

Five participants reported to feeling mentally relaxed and calm during their pre-performance period.

I was very relaxed. I wasn't even thinking about the performance really. (Participant 2).

Um...yeah...probably quite calm. I try not to let myself get too wound up by too many things. I tend to be...pretty relaxed for concerts. (Participant 8).

Another two musicians talked about how positive and confident they felt prior to their optimal performance, and how they comfortable they felt in their own skin.

Um...I would say it was very positive...um...I think...I felt...comfortable, I felt, I felt...I felt that I knew I was going to do a good job...um...you know...and I felt and it...just, I felt I, I, I knew there were no...there were no points that were gonna be a...a, a problem for me...and I, I kind, is like a kind of, I knew exactly what was going to happen...um...within, you know, my sphere of influence as it were...ah...So yeah, I think I just sort of, you know, and there was no...there were no extraneous...thoughts or...you know I was, I've just thought, felt focused, relaxed and confident that it was all gonna go well. (Participant 3).

Four participants also talked about heightened focused prior to performance.

"Right, okay. Instead of thinking, worrying about the technical aspect of what I'm playing, I'm not even gonna think about that. I'm just gonna think about, um...following the musical line, ah...making, getting that feeling in the arm, and um...and, and let the rest happen, "I

know this piece so let the rest happen". And, and that's what I did in the concert, and it felt the same, the same what I planned to do. (Participant 1).

Besides positivity, confidence and focus, orchestral musicians also reported feeling a sense of anticipation and excitement before going on stage.

You know you've got, there's a lot of anticipation. I was…I had friends come to the concert. I was really…looking forward to it so there's a kind of…even though, you know, I've done this for…for years…you know, if, if there's something I'm really looking forward to playing, I, I will be…yeah! excited, you know, sort of…really looking forward to the performance…uhm specially you now if you've put a lot of work in, it's music that, you know, you have favourite pieces and they maybe don't come up very often – could be years - so I, I definitely would have been very…yeah really looking forward to it, feeling really engaged about…the whole sort of lead-up to…the moment we have to play. (Participant 12).

Eh...before...nervous...(long hesitation)...prepared...so it was like, nervous, but I had the confidence. I thought, okay, I was capable (…) I had the confidence that my preparation [unintelligible]...um...it's like excited nerves...and...probably quite grounded. (Participant 4).

I think you just, you get tired obviously but you can live in the state of this excitement as well, and...you're nervous but the kind of good nervous. (Participant 5).

5.1.1.4 Physical and mental states during optimal performance

Physical state

All participants reported feeling physically well during their optimal performance, including the ones feeling tingling sensations in their chests or an accelerated heartrate during the pre-performance period. One participant talked about how enjoyment from performance impacts physical well-being.

A lot of it is always to do with how much you're enjoying the performance of course. You feel more tight, you don't…you feel energized if you're loving it. When you feel more *physically weary if it's not something that you're that into and suddenly you start "Oh my arm hurts" or "My shoulder aches" and this and that, but if it's something like that which was a massive play but because I like it I didn't actually physically feel any negatives from it.* (Participant 12).

Mental state

Participants (*n* = 3) reported a feeling of calm during optimal performance. Two of these musicians described this instance as a moment in which their mind chatter subsided and gave way to a more positive voice inside their heads.

Yeah, I think...an optimum performance tends to feel very calm...um...even if your heart is beating incredibly fast...um...there's the kind of stillness...where...everything is...slowed down almost? I don't know where you have, you feel like you have more time than you do...um...and then...nothing seems to be rushed and nothing feels out of control...um...It's very rare [laughs] so...Yeah, I think, I think...when you feel like everything is...at its best, then things feel...they get slower, yeah, and calmer. (Participant 8).

When I'm having, am having a good concert, that monologue is quite reassuring...um...If everything's going well and if, if the orchestra is playing well and then...and I'm having a good time, and I'm prepared, the monologue can be quite...encouraging. So it just gets better and better. (Participant 10).

Optimal performance was also characterised by positivity and confidence in playing for four of the musicians.

I think...I think the same. I think I just felt, and I think, for me, an optimum performance is when I feel so...um...involved...in, in what in, musically what's going on and I feel so...sure of where it's going and sort of...wrapped up in the...the direction and the, and the story...that the voice kind of, is, a bit quietened. (Participant 7).

A good number of participants (*n* =8) felt in the zone and experienced heightened focus and automaticity.

Um...I was in the zone. I was, I was ehm...I didn't have to think about what I was playing. Ehm, and I didn't have to think about reacting I was...really...eh... subconsciously part of the...the whole orchestra at that point ah...And it's when I'm not...that's for me a way that I know that I've...ehm...it's been optimal performance when I've just, not been thinking about it at all. (Participant 2).

It just felt...um...like autopilot but in a, in a good way, completely engaged, but not in a sort of tunnel vision sort of way, just, just everything was working...ah...and there's one little, there's a little passage, a little solo for two cellos...um...a little duet...um...which...is quite, sort of, nuanced...um...and I just sort of felt that I could just completely follow the principal cello. (Participant 3).

Eh...I think, at the very...beginning...I think we were playing a Beethoven Overture but I can't remember where it was but [unintelligible] well so it was just fun. I was just really really enjoyed it...um...and then we played a, there was a violin concerto...was it Bruch? (...) I wasn't sitting there thinking, "Wow! This is amazing!" I just sat there like I was just really not thinking. I was just kind of focusing and...and...counting and...trying to put things in the right place. (Participant 4).

The majority of participants (*n* = 11) experienced feelings of elation and emotional connection to both the music and their colleagues.

During I, I really wasn't...I was only thinking about these climactic extra, which I really like, I have on playlist. Em, I, I was really enjoying those bits, um, and thinking about how I've been waiting to play these, these moments for ages. For years I finally got to do it. But. um, aside from that, I was, um, really, I was sitting right behind the woodwind section and...it was the first performance of our new principal clarinettist. And so I was right between him and also our principal bassonist and like they, they were amazing and I was mostly just enjoying what they were doing. I wasn't thinking too hard about... anything other than how good they sounded. (Participant 2).

It makes me wanna cry. It absolutely makes me want to cry. I think it's a culmination of...I don't even know what it is but it's just like when all of your senses build up and it's overwhelming. It really is overwhelming (...) Something happened when we got to like *the last couple pages of the Mahler Symphony…it's that when everyone works together and everyone is on the same page and you get that hair standing on the back of your neck, you get the goosebumps when you're playing. You can't exactly explain why it's happening but like somehow all the sound and everything working together it gives you such satisfaction and such joy I physically can't put into words. It's this feeling…like time stands still and everything is just…everything is so pleasing to the senses. That to me is an optimal performance. It's not about playing perfectly…it's like in a professional orchestra basically notes are important but it's not the most important thing. I think it's experience that we have together that is very important.* (Participant 11).

5.1.1.5 Performance strategies adopted to reproduce optimal performance

To be able to replicate optimal performance, musicians employed several physical and mental strategies along the day of performance and during their pre-performance period.

Physical strategies

Two musicians reported having practising and/or simulated performance on the days leading to the optimal performance and during their pre-performance period. To replicate the feeling of playing with cold hands and fingers, one performer rehearsed jumping into repertoire without first having warmed up so as to get comfortable with playing in such conditions.

So...the tendency when you know, when you're practising is, or for me anyway, I gear up, you know, I tune the cello up, I play a scale, I, you know, I get warmed up and then I stop, do some work on something and then I might, then at the end of it might be in this sort of...performance, practising performing or whatever...um...but sometimes it's not...it's not possible to get...yourself completely warmed up before playing for all sorts of different reasons. So I've actually, recently, I've been practising...getting...practising playing something as soon as I get the instrument out to try and get that feeling...um...straightaway, rather than just relying on...arriving at that after having done the scale for half an hour, whatever it might be. (Participant 3).

Another participant reported simulating performance between rehearsals or directly before performance while alone on stage.

When I'm playing on stage...in a break or...after rehearsal before a concert, I think that helps because when you're sat playing on your own, you feel quite exposed...and that'll help me...start to get a bit nervous...um...and also without [unintelligible] just because you're going through so many programmes like...if, if you're on tour and you're doing a piano concerto and you're literally just rehearsing it in the seat [unintelligible] and then playing it, I mean, you don't really need to do anything to get those nerves for that because...it's gonna be exciting because you know, you haven't had...a day of rehearsal on it [laughs]. (Participant 4).

Prior to going on stage, three participants warmed up on their instrument.

But I would know that in order to feel ready, I will have got onto the stage bit earlier, ah...which, which I normally do anyway a little bit, um...and just try and play some scales and warm up. But you know, it's 5 minutes. It can't be very much more than that. (Participant 1).

But I do find obviously, that that spending a lot of time warming-up and finding the sound and everything, can settle one's...can, can can help me settle a little bit and I will definitely do that sort of before...a performance that I really care about, like whether it'll be a quartet performance or something like that, then I will definitely, I will take a lot of time to warm-up...um...I do, I...do probably need a lot of time to, to, to warm-up to be in an optimal state...um...in any case, just because I...I don't know...I, I need a good 20 to 25 minutes of playing before everything's really nice and loose and, and, and relaxed. (Participant 6).

Rest and/or napping (n = 2) were also mentioned among the strategies employed prior to optimal performance.

And...if it's going to be a long, long concert ideally, (inaudible) I like to have a nap. Now, that was not always the case. That's happened as I got...as I've gotten older. But now I play a lot of...um...world music and (inaudible) music and the nap situation is usually not possible because we usually have to have a soundcheck...um...and it's, it's a different type *of...performance environment so I'm not at home. That's having an influence on my, on my performance quality.* (Participant 9).

So I find with me, it's more if I'm really tired and ah...yeah, it gets a bit shaky just because of being tired and having to do something (...) But then if you don't have a nap then also makes you, makes me shaky if I don't have enough energy to kind of. (Participant 5).

Another physical strategy musicians reported on using was physical exercise. On the day of optimal performance, participants (n = 3) went for long runs or undertook short bouts of exercise. The reason behind such exercise was (1) to help manage anxiety and generate a state of calm, (2) to energize, (3) to stick to their usual pre-performance routine.

Just...it just calms me down. It stops...(long hesitation) um...it stops me um...getting too...um...unfocused in my head. Somehow just can kind of, yeah, my brain becomes clearer. (Participant 7).

I'll do push-ups or do some star jumps or something like that to try and get some energy going. I mean that's...more for me is that I'm so relaxed, that I could fall asleep, more so than being so nervous that I'm dangling on stage (...) Anything up to 20 seconds before, from 10 minutes before to 20 seconds before to try and get some energy up (...) If I can go for a quick, if I can walk outside when it's very cold and go for a, go for a quick walk while it's really cold outside kind of, you know, get my metabolism going [chuckles] or something like that to shock my system? Yeah, those sorts of things. (Participant 2).

If I'm, particularly if I'm feeling tired and I've been busy [unintelligible], I'd probably do actually still...like, do the physical exercise, the performance kind of thing that [X] is given me...um...just as a part of the routine. (Participant 4).

One participant, however, reported having conserved energy levels prior to optimal performance:

I probably do kind of limit my energy levels. I probably don't do anything too strenuous but...in a relaxed environment kind of thing. (Participant 8).

Breathing exercises and the use of therapeutic remedies were also among the strategies used (n = 1).

> *Sometimes if I'm feeling, um...like my heart is beating a bit too quickly...I will...do a breathing exercise. We breathe in...and count to five, hold your breath and count to seven, and then breathe out and I think count to seven. Something like that, and you do that, um...10 times in a row, and it just calms everything down*. (Participant 7).

> *Sometimes I take Rescue Remedy…It's like a...herbal...I'm not sure what it's made out of actually but [unintelligible] and you just take a few drops and it kind of...relaxes you. And it's probably psychosomatic but...it's kinda, it's quite comforting, so I might take something like that (…) Quite a lot of musicians use it, Rescue Remedy. Um...yeah, so I'd...take that as normally...I need probably 20, 30 minutes before...a concert, preferably. I prefer that to have time to just get in the zone*. (Participant 7).

Mental strategies

One mental strategy used was distraction (n = 1). The participant reported keeping the mind away from performance through reading as it calmed down their thought processes and helped them focus.

> *I want to slow my thought processes down...um...and so with, even with excited nerves sometimes...my thoughts can get a bit faster...but then it kind of comes in a wave and then I just...kind of...don't know, read a bit and...it, it calms down*. (Participant 4).

The idea of calming down one’s thought processes was also mentioned by another participant who achieved focus during performance by concentrating on the musical line instead of on technicalities and the pressure of performance.

> *It's a...kind of just slow everything down and just try to let things...happen, and also actually quite a good...ah...technique I find is just, is, is just singing the line...in, in...the head as it's going along or, if, you know, I'm playing an accompanying role, just focusing on the line of...that we're accompanying rather than...what I'm actually doing, so it is again, again just about trying to focus on the music rather than...anything else.* (Participant 3).

Attentional focus was also mentioned by five of the participants who shifted between internal and external focus by zooming out of one's own playing and focusing on how the orchestra sounded as a whole.

I think...um...yeah it's...it's about trying to, to...just focus on the, on the...the musical line and not, not on myself...um...and, and just, you know reinforcing certain messages and, and, and just, you know. (Participant 3).

I think it's (unintelligible) the music and about the character of, of the music that we're going to play ah...and...So I will be trying to think of that and remember what the conductor if, if he or she is any good, has said about that um...what they're trying to achieve in the performance, and what the music is about. So I think about, trying to think about, the mood of...of the beginning of that concert, what, what kind of mood is the piece in, and especially if it's in a, it's in a, you know, if it's sort of loud, and it's a, a big Overture style, not so much, but you just play it like that, but if it's, if it's sort of a more wistful, if it's um...if it's trying to say something else, then try to sort of think about that in advance of, of the conductor coming in um...and, you know, standing up and sort of try and get yourself into the musical ah...ah...mood of, of the piece. I'll try to do that, try to engage...ah...myself with, with that um...that mood. (Participant 1).

Musicians ($n = 4$) also reported being aware of one's critical voice and being able to reword negative thoughts. One way of doing so was by once again shifting attention from the negative thoughts in one's head to phrasing in the music.

Yeah, um...I think what I probably try to achieve is a...um...a kind of...um...mindfulness of...of my mental state. So if I catch myself starting to think some negative thoughts, ah, I think, "Hang on a minute! Hang on a minute! What you're doing, what you're doing, you know, this is not going to end well". So then try to...ah...sort of banish them and maybe focus more on, on the music in front of me, rather than anything, you know, the, the, the vast store of negative ah...negative stories or, or things that you can, you can kind of ask in, in, in a not very productive way, but without really realising you're doing it (…) it's just the awareness of trying to catch yourself...ah...thinking a negative thought, and try to move away from that and think about the music on the page, the musical line, and rather *than you're about yourself, in your own, ah...your own weaknesses, your own fallibility.* (Participant 1).

But for me, it's all up here. It's what I tell myself, whether it's…you know, "you know you can play this because you've practiced it, so what's the big deal? Or, you know, it doesn't matter if it goes wrong, it's just…a concert. It's not, you know, nobody died". It's…you have…for me it's very much…the anxiety stems from…from a mental state for me that for some reason I feel…uncomfortable mentally…and, and the only way for me to get out of that, (…) you have to kind of talk yourself out of it? Because your brain will do stupid things. It will decide "Oh no, you can't do this" even though you've done it a hundred times…and you just have to reverse…the sentiment very quickly and tell yourself…calm yourself, think of something very tranquil (…) But I think, I think the power of the mind…you know, even though it's trying to tell you, you can't do something, you can, you can reverse that. You can be like "No I can do this, don't be so silly", and then try and calm yourself down [laughs]. (Participant 12).

For other musicians (*n* = 3), having a pre-performance routine and sticking to it no matter the circumstance was another of the strategies employed towards optimal performance.

Well, I, I suppose that's, well, I suppose that is all in, in the routine. It's in doing the same thing before every concert. It's in like, spending the same amount of time getting changed...doing things, to me anyway, doing things in the same order like having dinner, then getting changed, then getting a bit, I suppose it's like trying to create that, that same...ritual before...going on but...it's not foolproof. I guess it doesn't always work because there are times when you're just tired or you're not into it or maybe you've had some...personal stuff happened that day or...um...So yeah, I guess it is just in like...trying to keep...keep that routine the same and not um...like if, if I'm having to rush around and I don't have time to do the routine, I do think that...affects how the performance feels...um...and I might feel less connected to it...like from what I can just go through the motions if I'm kind of rushing around. So I suppose giving myself time. (Participant 4).

Yeah, so I have a kind of a...kind of like a routine I guess. Sort of little things like...I have to have a banana (…) something small, maybe not that it's good to have a banana...I *always like to have eaten something before, if it's not the banana like a meal or something.* (Participant 9).

Other participants (*n* = 5) commented on how they preferred to treat any performance with the orchestra as any other day on the job as it was important for them to normalize their day as much as possible. Although these participants commented on not having any strategy to reproduce optimal performance, not having a strategy is a strategy in itself.

I don't, I don't think about it. I just turn up and I see it as doing a job. What I do when I walk out there and I mean...it's, it's, yeah, I kind of go out and I do my job, and I go back in and...I enjoy myself but it's, it's not a...it's not something I think about and I have to cogitate and, and psych myself up for it anyway. (Participant 2).

I would treat life normally I think, in terms of, if you know, often it's very sociable, so people are sitting around before a concert...um...so I would just join in with the conversations. (Participant 8).

For me there's no change in when I'm on stage and when I'm off the stage. I found that this way that I could perform the way I want to because all my other variables are the same. Does that make sense? For example, if I have a very important audition, I purposely do not change my routine…I don't want that day to feel any different than any other day. So I will do my best to make it as calm as possible and make it as normal a day as possible. I will wake up at a normal time for whatever I want I feel like eating…I find that…yeah, I don't want to have this route…like "Oh it's going to be a special day so I'm going to wake up early, maybe, go for workout". I find that if I do this process it makes me feel like "Oh I should be nervous or I should be in a different mindset than I currently am". So I find that if there's an important performance or audition, the status quo is very key for me, that way…yeah. (Participant 11).

5.1.2 Worst performance

5.1.2.1 Pre-performance period and frequency of worst performances

Seven participants reported a difference in the duration of the pre-performance period between normal and worst performance. While some (*n* = 4) talked about a shorter pre-performance period, others (*n* = 3) commented on a longer one.

All performers (*n* = 12) pointed out that while having had their fair share of bad performances in the past, they no longer had as many instances of bad performance. One participant reported that "[i]t would have been more regular when I was...a student...um...yeah" (Participant 10) while another said that "generally, I'm much more prepared, and I have the time because my kids are older...too...And I know what it takes, um...more experience" (Participant 1). One orchestral musician also commented that since joining their current orchestra, they had not had any bad performances "in the last couple of years at all really" (Participant 8).

5.1.2.2 Technical and musical preparation

Orchestral musicians (*n* = 8) in the study reported that on the day of their worst performance they had not prepared well for performance. Some participants (*n* = 6) attributed this to a lack of preparation on their part: "I haven't really had time to prepare the piece" (Participant 7), and "[I] did not know the piece at all" (Participant 2).

Others (*n* = 2) attributed this lack of preparation to extensive repertoire being prepared over too short a time.

> *Sometimes I think, one...we just didn't rehearse enough and I didn't really know it enough, so it was just...nobody really knew what was going on and was really uncomfortable*. (Participant 5).

> *Yeah, I mean I, yeah, through no fault of, of my own or my colleagues' end but we were barely rehearsed (…) Yeah, but it came at a time…in our lives where…we had massive programme after massive programme…and we would, actually that day we did two concerts…so there was no time to…really prepare*. (Participant 12).

On the other hand, four musicians reported experiencing their worst performance even when they were well-prepared.

Um...I don't think it was, I don't think it was anything that I was unfamiliar with. (Participant 3).

Well, it would have been...I would have been prepared for the piece. (Participant 10).

One participant also reported having over practised the repertoire.

It's something which I sort of just worked...worked myself up over a little bit...technically and, and, and things like that (...) I would prepare everything. So I would always...I would...find that passage beforehand which I thought, "Oh this might be difficult for me," and then I would practice to death (laughs). And then in so doing, make it more difficult for myself. (Participant 6).

5.1.2.3 Physical and mental states prior to worst performance

Physical state

A few participants (*n* = 2) recounted how on the day of worst performance they had been going through a phase where they did not enjoy good general physical health.

[Physical state was] not good. Not good probably because, I mean, there'll be a number of things. It'll be um...when I had young kids and I didn't have enough time to prepare, and I was also torn between...looking, being with the kids when I was at home, or practising. So therefore not, not in a physically in a good place...ah...and so therefore then mentally not in a good place. And um...yeah, so...that I was already anticipating, setting myself up for failure. (Participant 1).

I can be...pinpointing one particular...um...ah...where I've been, where I've been off work...for when I said about this shoulder problem and I had to, I've had to just slightly...change the way I was sitting and, and...um...and incorporate a slightly different way of playing to stop the, the, the...So it was when I came back from that...ah...so I was come back from, you know, so it was...the situation felt, you know, familiar in the sense that I was going back to...back to work but unfamiliar because I hadn't...been doing it for

3 months um... Yeah, but only it was...To start with I couldn't play at all, and then it was building it up, little by little by little but of course, and I was, I, I felt that I was, my playing was okay...um...but then, when I actually got on the platform in the concert, it all felt really unfamiliar. (Participant 3).

One participant also commented on how they had had no time during which to practice outside of rehearsals: “there was enough, never enough time, I didn't get enough sleep...so all of those things were ah...contributing to, to not being prepared for...performance (Participant 1).

Performers’ physical state prior to their worst performance also included lack of sleep and fatigue, induced particularly by intense performance schedules especially when on tour (n = 4).

And we basically worked so hard touring and performing three, four different programmes a week, and we got this was the last week before...um...we went on out...a German tour, and then the year was over for us. And Bruckner 5 came up. And it was just, I was physically at a point where I couldn't practice, I hadn't listened to the piece of music, I didn't care anymore. I was so tired and overworked and it's just got a lot of...what a kind of...difficult arpeggios, random note scales. And I remember turning to the principal bass, and I said to him, "I, I just can't even read these notes anymore. Like, I'm just, I'm not even playing the notes. I can't read them, my brain will not learn anymore. It just weren't". And he said, "Mine either. I'm just so tired!" And I just realized it wasn't just me, everyone was so tired, that no one could really (chuckles) perform it all that well. (Participant 2).

We were in Vienna playing at Vienna Konzerthaus. We were doing Shostakovich 11…and this is like, this is in a string…we maybe did like 3 or 4 days in a row already, like I was very, very, very tired. Lots of early mornings and then lots of time on planes and buses – you’re extremely tired. (Participant 11).

Um...I was probably very tired. It was a tour...ah...which to me we would have travelled a lot, probably quite a lot of late nights...um...and also, you know, absorbing huge amount of new people and new environment. (Participant 8).

Participants (*n* = 4) also talked about experiencing general physical tension on the day of performance.

Just generally...like you know when you just sort of hold your whole body? (...) My left hand sometimes I grip too hard on the fingerboard. It sort of manifests itself like that. Um...probably it's my left side that's more tense...and my feet are also, my feet go tense [chuckles]. (Participant 7).

I'm sure I was like super tense. I, I'm sure I would have been like really…yeah, feeling very tense and stressed, because in the moment anything is difficult and you sort of [makes panicked noises] like, and you just sort of everything locks up…and, and obviously there's a horrible feeling of being unsure…as well, which makes you more tense. (Participant 12).

Mental state

Stress outside of work also impacted performance. Such stressors included changing jobs and relocating, as well as other more personal issues such as relationships and rearing children.

It was actually it was my first concert here um...and when I got the job, so I'd been on trial for a year, and...then started job in October and...it had to move from London. It was quite a stressful...time, not just cause of the move but in my relationship and...starting a new job and...I'd never had a symphony orchestra job before. (Participant 7).

When I had young kids and I didn't have enough time to prepare, and I was also torn between...looking, being with the kids when I was at home, or practising. So therefore not, not in a physically in a good place...ah...and so therefore then mentally not in a good place. And um...yeah, so...that I was already anticipating, setting myself up for failure. (Participant 2).

Besides physical fatigue, participants (*n* = 2) felt "basically physically and mentally tired yes" (Participant 11). Another said that "I was extremely fatigued. I remember having a nap in the afternoon, like normally I would practice all day. I didn't practice, went for a walk, I had a nap. I slept for about two hours on a couch in the back of [X] Hall" (Participant 2).

There was also rumination on the day of performance where participants (*n* = 4) worried over difficult passages in the repertoire.

Probably before as well I mean, I think it...it was a hard piece...and it was one of those where it, it didn't even go...like I didn't even get it all right in the rehearsal so...it was just like one of those concerts or like pieces that you say, "Right, well, my aim is just to get through it rather than (laughs) do anything musical or artistic. (Participant 4).

Well, just very stressed because you, you know, we kind of knew that...the conductor is not gonna help, we haven't rehearsed it enough, it's quite hard and...things like that so...(Participant 5).

Not having had enough rehearsal time to go over repertoire also caused one participant to feel negative emotions prior to performance.

All the way, sort of, through the whole experience, because it became very clear we wouldn't get through everything, and there was music that was quite difficult (…) That, and very much the feeling that it's all right for him because he's not making the sounds [laughs]. But we sound…like a bad performance. Because of course whenever you see bad reviews, and you say, "Oh, this sounded terrible," and…you know, sometimes it…you can't be helped because you don't know how it led up…to that situation. So…but it will always be the orchestra that kind of comes under fire because it'll be like "Oh, this was scrappy, people weren't playing together, wrong this, wrong that." So…uhm…yes, I, I remember feeling like a real, like, red hot…anger…in that, [laughs] that situation. (Participant 12).

One participant also ruminated about their injury and the implications of these on their career.

It was so dependent on a, on a major external...um...thing that it was, it was to do, it was more to do I think, you know my anxiety about whether I was actually gonna be able to play properly, to a, to a high enough level (…) you know, feeling that I was not on the same level as everybody else, feeling...that I didn't know...I didn't know whether I was *gonna be able to carry on playing. That, that was the thing. I think I...I'd got to think, "Well, this is, this is got to work, otherwise, you know*... (Participant 3).

On the day of worst performance musicians (*n* = 2) also commented on how they had not as yet forged significant social and musical connections with their colleagues as they were on trial and were therefore new orchestral members.

It was actually it was my first concert here um...and when I got the job, so I'd been on trial for a year, and...then started job in October and...it had to move from London (...) starting a new job and...I'd never had a symphony orchestra job before...I barely played in symphony orchestra...um...and...I didn't know anyone, well, those kind of things. Well, I mean, I'd got to know them through my trial but...it was all just really new. (Participant 7).

Yeah, I get, yep, if I think about it now, none of the things I described about being good before a concert were there [laughs]. Um...like I didn't have a nice safe group of people that I could go and talk to, I didn't have, I didn't know anybody way well, I didn't have a strong connection with anyone musically...um...I didn't know the conductor yet...um...Although I thought he was great but...it didn't...idea, there was no safety net also encouraged what I've described before. (Participant 8).

5.1.2.4 Physical and mental states during worst performance

Physical state

Half of the musicians (*n* = 6) reported feeling physical tension during their worst performance. Four of these reported general tension, one reported tension in-between the shoulders, and another in the left side of their body, particularly the hand and leg.

Well, I think we're just getting tense as I said, and then once you get to the stage getting tenser and tenser, you come off the stage and your everything hurts, neck, arms, everything cause it's all like just one big muscle, tight muscle...and the headaches, yeah. (Participant 5).

Well playing, I mean...tension...um...[smirks]...ah...I remember not being able to, my overriding memory is not being able to remove my bow or...or get my bow on the string *or...so I imagine that that would be...pretty extremely tense and...um...fraught, physically? I don't know (...) I actually almost remember feeling...pain almost to...because I was (unintelligible) so tight that I...actually to bring my bow to the string was so uncomfortable...um...that...Oh God, yeah*. (Participant 8).

It tends to be here [points behind and in-between her shoulders]. (Participant 4).

Just generally...like you know when you just sort of hold your whole body? (...) My left hand sometimes I grip too hard on the fingerboard. It sort of manifests itself like that. Um...probably it's my left side that's more tense...and my feet are also, my feet go tense [chuckles]. (Participant 7).

One participant recounted how the difficult passages in the repertoire were met with palpitations. Another musician reported how their palpitations were accompanied with sweating whenever they came to an exposed section in the repertoire.

Oh definitely elevated heart rate, definitely um...yeah...um...nervous. (Participant 6).

The things that will happen to me were, would be, when I start to sweat, that's what I'm saying...eh...and if I get a sweaty hand, I know it's a bit of an overshare but, but if I get a bit of a sweaty hand, one of the things I'm thinking is, "Now you got all nervous, you've got a sweaty hand. Don't drop the bow in the middle of the gig! (...) So, you know, every, every time you come up to an exposed section of music. (Participant 10).

Fatigue was also one of the factors mentioned by one of the participants.

And I remember in the piece, I had to stop playing for a little while because my right thumb was so sore from gripping the bow. I looked over and I like just kind of had to stop. I looked over and the principal instead of holding the bow like this (shows me how), he kind of had this death grip where he had his thumb underneath and it was just like sawing away from his shoulder. Ah, you know, I just realized everyone was absolutely feeling the same - exhausted. And it was just...I just played terribly badly. And I could hardly play, I mean, I shouldn't have played, I was really risking injury and...yeah. I couldn't contribute there. (Participant 2).

Mental state

Half of the musicians in the study (n = 6) reported on feelings of anxiety and rumination during performance. In the moment in which musicians came to parts of the repertoire which they did not feel comfortable with and which they did not play well, performers reported on losing focus and concentration throughout the rest of performance.

And so that sort of ah....was...something which was...preying on my mind, and in the concert, there was one particular call which was incredibly quiet, and...I wasn't happy ah...and so...I just felt really uncomfortable, and it was horrible. But then afterwards, it meant that my concentration was shot to pieces for the next passage where it which was kind of um...you know, faster, and...um...you need to be on the ball, and so I wasn't on the ball for that. And so therefore that, also made it, made it worse. So yeah, it was pretty bad. (Participant 1).

Oh, all over the place. Um...not good, not calm...um...very distracted...um...yeah I...[huffs, long hesitation]...ah...Yeah, I remember this as being a complete disaster so I imagine it was...to think back that mental state I imagine that I just, I was unfocused, I couldn't...and I couldn't get my focus back. I didn't know yet how to get my focus back. (Participant 8).

Making mistakes also sparked musicians critical voice (n = 2).
I just remember making that mistake and then, my initial thought was...eh...yeah, "You're not good enough". (Participant 10).

Mentally, um...I think I just felt really, I remember feeling really anxious and thinking that um...why had they given me this job. Remember that thought going through my head, um...um, tense, but incredibly tense, and...I didn't have, because everything was going on I just didn't have, um...the space in my brain to allow myself to calm down. There's too much, there's...I didn't have a voice of reason anywhere to help me. (Participant 7).

Anxiety also brought on a sense of loss of control in one of the participants.

Feeling like...a bit like feeling like you've got out the wrong side of bed in the morning and...everything's happening...inside, everything's happening to you, you're not kind of taking it in your stride or...um...I can't think of the right...it's like things are getting away *from you. I say it feels like being on a high-speed train and it's like bah bah bah bah bah [laughs].* (Participant 4).

Intense performance and touring schedules were among the reasons for musicians' mental fatigue (n = 2).

I was so tired and overworked and it's just got a lot of...what a kind of...difficult arpeggios, random note scales. And I remember turning to the principal bass, and I said to him, "I, I just can't even read these notes anymore. Like, I'm just, I'm not even playing the notes. I can't read them, my brain will not learn anymore. (Participant 2).

5.1.2.5 Performance strategies adopted to help with worst performance

Musicians were asked about any physical or mental strategies they employed to help them mitigate worst performances. Four participants reported that they had no strategies to help with their physical and mental state prior to and during performance.

Actually, I would say not. I would say not, and there wasn't anything at that time. (...) I didn't have any means of...of being able to, to say to anybody, "I'm going through a bad time, I need a bit of help". (Participant 1).

In retrospect, I would, I could, I could have...um...prepared myself mentally for that but I, I didn't and I was then just fixated on...this has got to work otherwise, you know, I can't play. (Participant 3).

Others (n = 4) reported on conserving energy through either having a rest and/or napping prior to performance: "I didn't have the energy to go for a run or to do push-ups. I was already just so tired that nothing was gonna...I just need to conserve my energy for the performance" (Participant 2).

Another musician talked about the importance of staying away from stressful situations: "I think it is important to...well, it's certainly important for me to try and...make sure there aren't too many um...things in your personal life...that create great anxiety...ah...if you can avoid them so you at least have something where you feel...you can relax (Participant 7).

Strategies that musicians mentioned adopting during their worst performance were breathing (n = 3), diverting one's attention from the stress-inducing object (n = 1), and looking at colleagues for performance cues (n = 1).

> *Relaxation and breathing and...[hesitates]...yeah... (…) Well, I mean, if I saw a passage coming up on the, on the opposite page, then I could feel my...um...heart, my heart rate start to go, then I would already then start trying to lower it...um...but I have...found also through experience that sort of focusing on different aspects or maybe focusing on relaxing a shoulder or both shoulders or, or a certain part of the arm or something like that would kind of just deflect a little bit from the actual focus of, of the passage*. (Participant 6).

> *So if you're, if we're all playing, you know, we're all...last night there was six of us in a line...and two slightly behind, so we can all see each other. That really helps...because it'd be very strange if you played a note and no one else was preparing that note. So there's, there's something about seeing your colleagues*. (Participant 10).

5.2 DISCUSSION

Musicians reported that their perceived optimal performance was preceded by positive physical and mental states such as relaxation, tingling sensations in the chest perceived as excitement, and enhanced focus and confidence. Worst performance, on the other hand, was preceded by negative physical and mental states such as muscle tension, physical and mental fatigue, and rumination about repertoire and injury.

Results showed that while most musicians had vivid recollections of optimal and worst performance, a few could not pinpoint a particularly good or bad performance. Interestingly, this seemed to be pertinent with pit musicians who, as already shown in Chapter 4, coincidentally reported among the shortest pre-performance periods between and across normal, optimal and substandard performances. A possible interpretation for this might be that pit musicians in this study do not experience performance in the same way as symphonic/philharmonic musicians do due to there not being much of a divide between rehearsals and performances. In both scenarios, in fact, pit musicians generally remain in the pit and are, for the most part, hidden from the audience. This might impact musicians' level of arousal during performance, effecting flow (Csikszentmihalyi, 1990).

Musicians' vivid recollections of optimal performances were also coupled with detailed recollections of their preparation which stood out in stark contrast to the sparse detail given on the preparation of substandard performances. This might suggest that the occurrence of optimal performance is enhanced through a thorough preparation of the repertoire. Whereas for substandard performances participants seemed to be solely concerned with practising difficult passages, for example, for optimal performances musicians went over and above practising passages, actively making time to include listening and/or watching recordings of the repertoire before performance, practising phrasing and practising according to stylistic patterns.

Participants highlighted, however, that their preparation of orchestral repertoire was no longer as thorough as it used to be prior to them becoming full time orchestral musicians. Reasons for this included a high-performance turnover, few rehearsals, and a busy personal schedule which did not allow for much individual practice. To compensate for this level of preparation musicians relied on sight-reading skills. As one participant stated, a lack of preparation during performance pushes one into a heightened state of focus. It is not surprising, therefore, that musicians' experience optimal performance while in this state as such experiences occur when skill is balanced by the challenge of performance during heightened focus (Csikszentmihalyi, 1990).

The implication of this is that the teaching of sight-reading skills in conservatoires should be given more weight, especially when one considers the importance this carries in helping musicians thrive during the high turnover of performances in an orchestral setting. Generally, however, music institutions are more focused on providing training towards a soloistic career, with ensemble playing as part of the curriculum. However, taking into consideration the large percentage of music students forging a career as ensemble players, as opposed to that of musicians making a career out of playing solo, music institutions should consider creating a formal programme geared exclusively towards ensemble playing. Such a programme could include skills specifically required in ensemble playing, such as blending one's tone with that of the ensemble to create a homogenous sound, communication skills between co-performers – especially for small ensembles – and social interaction.

Musicians reported their worst performances happened despite having been well-prepared for performance. Preparation for these performances was due in part to several rehearsals and repeat performances of opera/ballet productions, and to repeat performances while on tour. However, literature suggests that musicians' physical, psychological and occupational stressors, such as fatigue and touring, can have a detrimental effect on performance (Kenny & Ackermann, 2009). With most musicians reporting their worst performance while on tour or during repeat, long performances, it is possible that these factors might have contributed to the resulting worst performances. The present findings, therefore, highlight the importance that orchestral bodies play in planning performance programmes and touring schedules which safeguard orchestral musicians' health and wellbeing. This is further evidenced by musicians' reported mental and physical state prior to their worst performance which included mental and physical fatigue, negative emotions such as anger and upset related to poor rehearsal schedules and inadequate conductors, and the resulting muscle tension.

Some respondents (who in this sample, were males) attributed their worst performance to weak social connections with co-performers. This was particularly the case for participants having experienced worst performance during trial periods. Being relatively new to the orchestra, participants felt they had not yet forged meaningful relationships with colleagues and that therefore they lacked the emotional support they needed to face the pressures of performance. This ties in with findings in Study 1, further highlighted in Study 2 (Chapter 4), showing that prior to performance males seek out co-performers to energize and distract themselves from performance, preparing to go on stage as a team rather than as individuals. The implications of this for orchestral bodies is that one way of helping with recruits' health and wellbeing, helping them alleviate the pressures of performing, is through team building activities which facilitate and improve social connections between players.

While some participants experienced worst performance during trial periods, others flourished under the same conditions, experiencing optimal performance in an environment where social connections were not yet forged and support not forthcoming. Other participants also experienced optimal performances when pressure levels increased, such as when asked to change playing position and move from Sub-principal to Co-Principal or from a rank-and-file position to Co-Principal minutes before a trial performance. Such performances were then characterized by laser focus, alertness and accelerated heartrate.

The physical and mental states performers reported being in during the pre-performance period consolidated during performance; the positive states became more positive while the negative ones spiralled further. During optimal performance performers' general physical sensations were enhanced, mind chatter ceased, focus sharpened, and positivity and confidence flourished into feelings of elation and of a total immersion in the music. This is how flow is defined in the literature (Csikszentmihalyi, 1990; Biasutti, 2017; Harmat et al., 2021). Almost all participants recounted how during optimal performance they experienced strong emotional connections not only to the music but to each other, deriving energy from each other and reacting to one another, feeling part of a whole. During worst performance, on the other hand, muscle tension increased, accelerated heartrate was perceived as palpitations, and rumination gave rise to an inability to focus, an incessant critical voice and the feeling of being out of control. This critical deterioration in the execution of habitual processes resulting in substandard performance is defined in the literature as "choking under pressure" (Mesagno & Hill, 2013; Mesagno & Beckmann, 2017).

During interview, performers were asked whether they had strategies to help reproduce optimal performance. Musicians listed several of these including practising performance - such as playing with cold hands to replicate playing without warming up - napping and conserving energy. Participants also mentioned the importance of following one's pre-performance routine which, according to the literature, leads to enhanced performance if followed consistently (Jackson, 2003). Musicians also talked about engaging in physical exercise as a strategy towards optimal performance to help cope with anxiety, focus and alertness.

Interestingly, while performers' accounts of the physical strategies used for the optimisation of performance were clear, their accounts of mental strategies were not. As already mentioned in Chapter 4, musicians' descriptions of mental strategies were vague and in some instances unlikely, such as when participants mentioned engaging in deep breathing exercises while performing or when the terms meditation and breathing exercises were used interchangeably. Participants might have mentioned these mental skills because they had heard about them or felt that they ought to know about them, not because they adopted them.

Similarly, accounts were just as ambiguous when participants were asked for strategies they employed to help avoid substandard performances and/or to help cope with substandard ones if and as they happened. Some other participants, on the other hand, stated that they had no strategies to avoid or help them cope with bad performances, nor had they head of any. The implications of this are concerning especially when one considers the helplessness that transpires from performers' comments on how they feel they have no control over their performance. Although the teaching of psychological skills has already been introduced in some music institutions more work needs to be done to make this knowledge available in all music conservatoires but also in orchestral bodies as a way of equipping musicians with the necessary tools for performance optimisation. Such skills could help musicians gain more control over their performances, helping with motivation and self-fulfilment.

One of the limitations of this study was having had to conduct these interviews online which in some respects might have limited the level of engagement and impacted the personal connection with participants. Weak internet connections also led to hang ups which, in some instances, influenced conversational flow. Another limitation was that participants might have felt as if they ought to know about performance strategies and pre-performance routines and that therefore they might have felt the need to mention engaging in strategies they might have heard of but never engaged in. This was sometimes evidenced by the ambiguity with which participants described the performance strategies used. One other limitation to keep in mind was the probable inaccuracy of participants' recollections of their optimal and worst performance especially as these might have been further influenced by how good or how bad these performances were perceived to be. Future research might consider conducting in-person interviews where possible to enhance levels of conversational engagement and connection with participants. In-person interviews would also allow for a more accurate interpretation through eye contact, gestures, and body language.

5.3 SUMMARY

Study 2 was described over Chapters 4 and 5. Chapter 4 addressed the first part of RQ3 concerning professional musicians' perception on how pre-performance routines impacted performance. It therefore covered the analysis and results concerning performance strategies on the day of performance: (1) on performance day up to the onset of the pre-performance period, (2) during the pre-performance period. Chapter 5 addressed the second part of RQ3 on how professional musicians' perceptions of the effects pre-performance routines have on performance are reflected in the recollections of their optimal and worst performance.

As background work for Study 2, Chapter 4 presented results for musicians' perceived physical health, physical activity and exercise (PA/PE), and duration of the pre-performance period. Results showed the presence of playing-related musculoskeletal disorders (PRMDs) and of PA/PE in musicians as a means of maintaining general good health and help with improving PRMDs. As per results in Study 1, most participants in Study 2 engaged in daily/weekly physical exercise but this study was able to quantify the type of exercise. Participants reported engaging in a blend of endurance/cardio exercise and strength training 5 or more times a week for a total of 60 minutes or more, thus going over and above the recommended 150 minutes of moderate-intensity aerobic PA/PE per week (or 75 minutes of vigorous-intensity PA/PE) and muscle-strengthening activities two or more days weekly (World Health Organization [WHO], 2010). Participants in Study 2 showed no difference in frequency and duration of PA/PE across the different age groups, type of orchestra, and playing position.

Orchestral musicians gave various reasons for their daily/weekly engagement in PA/PE. These included ones related to medical conditions and others related to the offsetting of future ailments in order to sustain a career in performing. Participants also exercised to maintain good general physical and mental health, to promote positive wellbeing, and to cope with general stress and anxiety. Musicians also reported exercising with a view of improving playing posture and as a means of enhancing focus and productivity, therefore helping to sustain the demands of the job. PA/PE was also reported as a strategy towards coping with debilitative performance anxiety for its calming effect post-exercise.

PA/PE was also reported as a means of coping with the physical demands of performing. This was especially the case for pit musicians who highlighted the importance of building stamina to sustain the frequency of playing long rehearsals and performances. Some musicians also reported needing to be physically fit to perform. However, this belief was shared more by players of large instruments, such as cellists and double bassists, than by players of smaller instruments, such as violinists and violists. Moreover, musicians' need to be physically fit to perform revolved around the strength and stamina needed to play large instruments rather than on the cardiac demand required for performing (Inesta et al., 2008).

Although Study 1 showed no significant difference between gender and the duration of the pre-performance period, Study 2 showed that the pre-performance period in females was longer than that of males. It also showed that for some musicians, those males aged between

24-44, there was no pre-performance period as they reported being "always ready to perform". This may denote a confidence/over confidence factor in males and further research should investigate the relationship between the pre-performance period and gender, to understand the absence of a pre-performance period and the impact this may have on performance.

An important finding in relation to the pre-performance period is that pit musicians in Study 2 reported a shorter pre-performance period than symphonic/philharmonic musicians. This suggests a possible relationship between the pre-performance period and type of orchestra played in. The difference in the pre-performance period between orchestras may be attributed to several factors such as the number of required rehearsals and performances, performance space and performance scenario, all impacting how challenging or anxiety-inducing a performance is perceived as being. It is important to point out that performance scenario was also reported as impacting the pre-performance period within members of the same orchestra depending on whether the musician needed to play exposed or solo parts during performance. This suggests that research is needed in exploring the relationship between the pre-performance period and music performance anxiety.

In the period of time between the day of performance and onset of the pre-performance period, musicians reported spending time in going over general technical work or passages from the upcoming performance. Musicians also reported spending time exercising, with some avoiding specific types of exercises to avoid wrist strain, while others reported avoiding exercise altogether. During the pre-performance period, participants indicated going over technical work and repertoire they knew well as per findings in Study 1. Participants also reported exercising even between the dress rehearsal and performance showing that as per the finding in Study 1, participants do not change exercise rates during the pre-performance period. Study 2 therefore implies the need for performance spaces to cater for musicians' pre-performance routines, equipping them with facilities allowing musicians to exercise and shower prior to performance. This becomes especially important when one considers the reasons behind musicians' engagement with exercise which include achieving a heightened sense of calm, grounding, focus, and alertness prior to performance. Along with the suggested facilities, Study 2 also highlights the importance of musicians needing time alone to engage in pre-performance routines such as meditation and deep breathing exercises to help them optimize performance. This points to a need for having relevant spaces inside the performance venue.

Most participants reported having vivid recollections of their optimal and worst performances. Optimal performances were preceded by positive physical and mental states such as excitement and relaxation, while worst performances were preceded by negative states such as muscle tension, rumination and incessant brain chatter. Both positive and negative feelings intensified during performance. Optimal performance was characterised by a sense of positivity and confidence, feelings of elation and a total immersion in the music - findings which are in line with the literature on flow evidencing the complete sense of absorption and enjoyment in a task (Biasutti, 2011) - while worst performance derailed into an inability to focus, palpitations, and a sense of being out of control.

Most musicians' recollections of the repertoire played during optimal performance were also very vivid, with most reporting going over and above practising difficult passages, listening to recordings of the repertoire and practising according to stylistic patterns. However, musicians also highlighted that the high turnover of performances and their few corresponding rehearsals, together with other musical engagements, made it difficult to be fully prepared for performance. Musicians, therefore, compensated for this by resorting to their sight-reading skills. Study 2, therefore, makes the suggestion that as more students become ensemble members than they do soloists, all conservatoires should cater better for this career path by creating formal programs geared exclusively towards ensemble playing. Such a programme could focus on the skills required in ensemble playing, such as sight-reading, blending one's tone with that of the ensemble to create a homogenous sound, communication, and social interaction.

Professional orchestral musicians' recollections of their optimal and worst performance did not entirely reflect the perceived effects of their pre-performance routines. While some participants recollected engaging in pre-performance routines such as warming up, exercising, rewording negative thoughts to positive ones, and following one's pre-performance routine prior to experiencing optimal performance, others recollected engaging in such pre-performance routines yet still went on to experience suboptimal performances. Similarly, some musicians recollected experiencing optimal performance despite not having engaged in their usual pre-performance routines.

Study 2 also showed (perhaps surprisingly) that preparation level was not indicative of performance outcome. This occurred when musicians reported their worst performance despite preparing well for performance. However, what emerged here was that these performances happened while on tour or during long, repeat performances where musicians felt physically and mentally fatigued from the onset. It is therefore important for orchestral bodies to plan performance programmes and touring schedules around musicians' health and wellbeing. Another interesting finding is that musicians also attributed their worst performances to a period in which social connections with colleagues were poor. This highlights the importance of the social aspect within orchestras and calls for orchestral bodies to plan team bonding activities through which social connections between players and across sections can be facilitated.

One last finding from Study 2 is that musicians' report of strategies they used to reproduce optimal performance or to help cope with a substandard one, seemed to lack depth and consistency, whilst others reported they had no such strategies. This confirms literature which indicates that musicians may have heard of strategies for performance but not learnt how to use them, or might have learnt them ineffectively, or might not have truly understood their applicability or utility (Hays, 2002). It is interesting to note that participants' accounts of the physical strategies they adopted were much clearer than the mental ones. These included warming up, practising performance, having a nap and exercising. Reasons given for these physical strategies were to prepare the fingers for performances, and with reference to exercise, to enhance focus and concentration.

The above findings corroborated some findings from Study 1 and shed further light on the performance strategies and pre-performance routines engaged in by musicians as well as on the reasons behind such engagement. Study 2 also highlighted the role physical activity and exercise play in professional musicians' daily/weekly routine and its use in relation to performance. This then led into Study 3 in further investigating physical fitness in musicians, the PA/PE they engage in, and the perceived functions of PA/PE for their wellbeing and on performance.

CHAPTER 6

Physical Fitness, Activity and Exercise, and its Perceived Function for Wellbeing and on Performance

Study 3

6.1 INTRODUCTION

The research questions *Fit Musician* aims to answer are the following:

RQ4: What are professional musicians' perceptions of their levels of physical fitness?

RQ5: What physical activity and exercise do professional musicians engage in, and what are the reasons for this?

RQ6: What are the perceived functions of physical activity and exercise for wellbeing and on performance?

6.2 METHOD

6.2.1 Rationale for using the survey *Fit Musician* and its content

The method for data collection used in Study 3 was the survey. The rationale for using surveys has already been discussed in section 2.3.1. As surveys can be cross-sectional, capturing participants' responses at a particular point of time, the aim of the *Fit Musician* survey was to capture the responses of professional musicians on their perceived level of physical fitness, type of physical activity and exercise, and perceived function of physical activity and exercise on performance and wellbeing. It also sought to generalize responses.

To ensure the validity of a set of items addressing musicians' perceptions of levels of physical fitness (RQ4) and musicians' wellbeing (RQ6), the following standardised questionnaires were used: the International Physical Activity Questionnaire – Short Form (Craig et al., 2003) which had Cronbach's alpha (α) of .78; Mental Health Continuum Short Form 14-item scale (Keyes, 2002, 2005) (α = .91); the Centre for Epidemiologic Studies Depression (CES-D) Short Form 8-item scale (Karim et al., 2015) which had Cronbach's alpha (α) of .76; the Social Connectedness Revised 15-item scale (Lee et al., 2008) which had Cronbach's alpha (α) of .69; the UCLA Three-Item Loneliness Scale (Hughes et al., 2004, adapted from the Revised UCLA Loneliness Scale, Russell et al., 1980) (α = .76). The inclusion of these ad hoc questionnaires also allowed for comparisons to be drawn between the results of this thesis and those from previous research.

Since there is no existing questionnaire on professional musicians and physical activity, new questions were developed for the survey *Fit Musician* to investigate what physical activity and exercise professional musicians engage in and what the reasons behind this engagement are (RQ5), as well as to explore the perceived function physical activity and exercise have on performance (RQ6). To ensure validity and reliability of these items, these were first piloted by sending *Fit Musician* through email invitations to 15 professional and postgraduate instrumental conservatoire students. Data from this sample was analysed to ensure the survey yielded the required information. Final revisions to the survey were carried out after collecting participants' feedback. Statistical tests were also run to check whether the type of data collected was appropriate for the tests needing to be run. The project was then approved by the Conservatoires UK Research Ethics committee for an anonymised sample.

Like the *Pre-performance Routines* survey in Study 1 (Chapter 3), *Fit Musician* was also an online survey. The survey platform Qualtrics used for *Fit Musician* allowed marking items as mandatory, disallowing participants to skip and proceed till the necessary questions are answered, thus minimizing future problems associated with missing data. Using online surveys also allowed for the export of electronic data collection to Excel spreadsheets and Jamovi, the analysis software used for quantitative data analysis in this thesis.

6.2.2 Design of the *Fit Musician* survey

The *Fit Musician* survey (Appendix 3) was designed for three main purposes: (RQ4) to explore the perceptions of professional musicians on their levels of physical fitness, (RQ5) to investigate what physical activity and exercise professional musicians engage in and what the reasons for this engagement are, (RQ6) to explore what the perceived functions of physical activity and exercise are on professional musicians' wellbeing and performance experiences. The survey therefore covered five main areas: (1) demographics, (2) validated measures of health wellbeing and depression, (3) standardised measures for physical activity pre- and during COVID-19, (4) closed and open questions on physical exercise and performance, (5) validated measures on social connectedness and loneliness.

6.2.2.1 Measures

International Physical Activity Questionnaire – Short Form (IPAQ-SF) (Craig et al., 2003)

This scale was used to investigate RQ4 concerning musicians' perceptions of levels of physical fitness. This questionnaire was chosen as it is one of the two existing internationally comparable short self-report measures surveilling physical activity for adults between the age range of 15 – 69 years. The decision to use the short form was based on good psychometric properties of this version and consideration of overall survey length and respondent measurement burden. The IPAQ-SF provides an overall total physical activity estimate and is the shortest measure of physical activity available (Bauman et al., 2009). This questionnaire was used twice (1) to measure professional musicians' perceived levels of physical activity during COVID-19 - the period of time during which the survey was circulated - and (2) to measure perceived levels of physical fitness pre-pandemic. This was to provide as clear a picture as possible of musicians' perceived levels of fitness particularly outside of this exceptional time when musicians were still performing. To measure musicians' perceived levels of fitness pre-Covid-19, the description of the original questionnaire requiring participants to answer questions relating to the "last 7 days" was changed to answer questions in "a typical 7-day period pre-COVID-19".

IPAQ measures physical activity engaged in across a set of domains including (1) leisure time physical activity, (2) domestic and gardening activities, (3) work-related physical activity, and (4) transport-related physical activity. The IPAQ-SF asks about three specific types of activity - walking, moderate-intensity activities, and vigorous-intensity activities - undertaken in these four domains. Items provide separate scores on walking, moderate-intensity and vigorous-intensity exercise. Computation is done by calculating the sum of duration (minutes) and frequency (days) of walking, moderate-intensity, and vigorous-intensity activities.

Participants can be classified in three levels of physical activity: low, moderate and high. Those scoring a high level of physical activity can be categorized as having physical activity levels equating to approximately one or more hours of activity per day at not lower than a moderate intensity activity level. Participants scoring a high level of physical activity engage in either (1) a vigorous intensity activity on at least 3 days achieving a minimum total of 1500 Metabolic Equivalent of Task (MET) minutes a week, or (2) 7 or more days a week in any combination of walking, moderate or vigorous intensity activities achieving a minimum total of at least 3000 MET minutes. Those who score a moderate level of physical activity can be classified as having physical activity levels equating to half an hour of at least moderate intensity physical activity on most days of the week. Those who score a moderate level of physical activity engage in either (1) 3 or more days of vigorous intensity activity and/or walking for at least 30 minutes per day, or (2) 5 or more days of moderate intensity activity and/or walking of at least 30 minutes per day, or (3) 5 or more days of any combination of walking, moderate intensity, vigorous intensity activities resulting in a minimum total of at least 600 MET minutes per week. Participants scoring a low level of physical activity are not meeting any of the criteria for moderate or high levels of physical activity (Forde, 2018).

As there are no relevant questionnaires in the literature to help answer (1) RQ5 on what physical activity and exercise professional musicians engage in, and what the reasons behind this engagement are, and (2) RQ6 on musicians' perception of physical activity and exercise on performance, new closed and open questions had to be developed. Some of the closed questions were: (1) "In your years as a professional musician, did you normally do physical exercise or sport as part of your daily / weekly routine pre-COVID-19?" (2) During a typical week pre-COVID-19, on how many days did you usually do physical exercise (e.g. brisk walking, yoga and jogging) or sport?" (3) What type of physical exercise or sport did you used to do? Please tick all the options that apply to you" (4) At what level of intensity did you usually do physical exercise or sport? Tick all options that apply to you" (5) "As a professional musician pre-COVID-19, how often did you maintain your daily / weekly physical exercises or sport on the day of the performance scenario below?" (6) "In your years as a professional musician pre-COVID-19, did you ever use physical exercise or sport deliberately to help with performance?" (7) "How frequently did you use physical exercise or sport deliberately to help with performance?" (8) "In which scenarios did you deliberately use physical exercise or sport to help with performance? Please tick all the options that apply to you" (9) "What type of physical exercise or sport did you used to do? Please tick all the options that apply to you" (10) "Do you think that this deliberate exercise or sport had an effect on your performance?"

The open questions concerning the period of time prior to COVID-19 were: (1) "Briefly describe the specific type of physical exercise or sport you used to do", (2) "Why did you exercise? Starting from the main reason for doing regular physical exercise or sport, please tick any other reasons here", (3) "What were the reasons behind your deliberate use of physical exercise or sport to help with performance?" (4) "What is the effect that this deliberate physical exercise or sport had on performance?" These questions were compulsory and required free text responses with no character limit.

Mental Health Continuum Short Form (MHC-SF) 14-item scale (Keyes, 2002, 2005)

With as regards to measuring health and wellbeing, Seligman (2008) states that both positive and ill-health contribute to how mental and social wellbeing are experienced. Based on this view and on Spiro et al.'s (2021) study on the effects of the first COVID-19 lockdown on performing arts professionals in the UK, one outcome measure was used for a positive view and another for a symptom-led view of mental and social wellbeing. To investigate RQ6 concerning musicians' wellbeing, mental wellbeing was measured through mental health and depression, and social wellbeing through social connectedness and loneliness.

For mental wellbeing the Mental Health Continuum Short Form (MHC-SF) 14-item scale (Keyes, 2002, 2005) was used. The MHC-SF scale is made up of 3 items measuring hedonic dimensions – emotional wellbeing - and 11 items measuring eudaimonic dimensions – social and psychological wellbeing. Each of these items is rated on a 6-point scale (0 = "never", 1 = "once or twice", 2 = "about once a week", 3 = "2 or 3 times a week", 4 = "almost every day", 5 = "every day") generating a score ranging from 0-70. Higher scores indicate higher mental health. Participants can also be classified as either "flourishing" or "languishing" in mental health. If individuals experience at least seven of the symptoms "every day" or "almost every day", where one symptom is from the three hedonic dimensions (happy, interested in life or satisfied) then individuals can be classified as "flourishing". If participants experience at least one of the three hedonic dimensions and at least six of the eleven eudaimonic dimensions "never" or "once or twice" in the past month, then they can be classified as languishing. If participants do not fit the criteria for a flourishing or a languishing mental health they can be classified as being moderately mentally healthy.

Centre for Epidemiologic Studies Depression (CES-D) Short Form 8-item scale (Karim et al., 2015)

This scale was used to investigate depression. Each of the items has a Yes or No response option and the score is generated through a sum of present depressive symptoms. The score range is of 0-8 and if participants score three symptoms or more, they can be classified as depressed.

Social Connectedness Revised 15-item scale (Lee et al., 2008)

This scale was used to measure social connectedness. Each of the 15 items is rated on a 6-point scale ("strongly agree", "agree", "mildly agree", "mildly disagree", "disagree", "strongly disagree"). The higher the scores the stronger sense of social connectedness in individuals.

UCLA Three-Item Loneliness Scale (Hughes et al., 2004, adapted from the Revised UCLA Loneliness Scale, Russell et al., 1980)

This scale was used to measure loneliness. Each item in this scale is rated on a 3-point scale ("hardly ever or never", "some of the time", "often"), resulting in a score of 3 to 9. Individuals scoring between 6 – 9 can be classified as lonely based on prior dichotomization.

The reason for choosing the short over the long form for the above five questionnaires was due to their brevity as this made it possible to include all of them in the survey. These short forms have also been already used in various other studies including one which was carried out during the pandemic investigating the effects of the first COVID-19 lockdown on performing arts professionals (Spiro et al., 2021).

The full survey *Fit Musician* can be seen in Appendix 3.

6.2.3 Participants

The online survey *Fit Musician* (see Appendix 3) was sent to English-speaking international professional instrumentalists. These included full-time orchestral musicians, participants identifying primarily as freelancers, and postgraduate conservatoire students in performance practice as the latter are regarded as musicians who are either already working professionally or who are seeking further professional development. The survey was disseminated via Qualtrics. Informed written participant consent was obtained at the start of the online survey. The aim of the survey was to recruit as broad a spectrum of classical professional musicians as possible. In order to achieve this, email invitations to the survey were not only sent to musicians' unions, orchestras, and conservatoires in English-speaking countries but also to those in countries with a good level of English proficiency. Recruits were then invited to forward the email invitation to others who might be interested. The survey was also disseminated on various social media platforms mainly on Facebook, Twitter and Instagram tagging orchestral bodies, conservatoires and international musicians' unions such as Musicians Union (MU), Musicians Australia (MA) and New Zealand Musicians Union (NZMU) to increase participation from freelancers not likely connected to their former educational institutions and orchestras. Social media users were also invited to share the survey on their own social media platforms. Participants were also recruited on an individual basis chosen either because they are well known artists or because they form part of my own professional network. Recruitment was also done through paid Facebook adverts.

The survey was open to classical professional instrumental musicians. A total number of 160 participants took the survey but 16 were excluded for providing too little data. Out of the 144 remaining participants, 140 respondents reached the International Physical Activity Questionnaire – Short Form (IPAQ-SF) (Craig et al., 2003) and 98 respondents reached the final question. Therefore data analysis on demographics and mental and social wellbeing were carried out on 144 participants, analysis of the IPAQ-SF on a sample of 140, while data analysis of questions relating to participants' physical activity and exercise as well as their reasons for this engagement were conducted on 98 respondents. Participants were divided into three subgroups: respondents identifying as full-time orchestral musicians, and participants identifying primarily as either freelancers or postgraduate students. The three-way ANOVA run on this sample of 144 participants showed no significant differences in the other demographic characteristics of the three subgroups, which are analysed separately. This is because a difference in behaviour was expected between subgroups due to different career paths and current work status which impact factors such as financial security, flexibility in working schedules, regularity of performance, and contact with mentors, differently.

The demographics show that the largest number of participants were female (63%, n = 90), with males (36%, n = 52) and non-binary transexuals (1%, n = 2). Respondents ranged between 21-74 years of age (mean = 40.3, SD = 13.8). The largest number of participants was between 21 and 30 years of age (n = 43, 30%). Respondents between the ages of 31-40 made up 25% (n = 36) of participants, 19% (n = 27) were between 41-50 years old, while 18% (n = 26) were aged between 51-60 years, The smallest group of participants was over 61 years of age, accounting for 8% (n = 12) of participants.

The largest number of participants were string players (*n* = 67, 47%) with violinists making up the largest instrument group within the section (*n* = 29, 20%). Brass players made up 22% (*n* = 32) of the sample, while woodwind players made up 17% (*n* = 24), keyboardists 13% (*n* = 19), and percussionists 1% (*n* = 2). The distribution of all other instrument family groups is representative of other surveys concerning Western professional musicians (Harper, 2002; Ackermann et al., 2014; Berque et al., 2016). This shows that this sample is close to the proportions of the sector on these demographic characteristics.

Forty-three percent of respondents identified as being fulltime orchestral musicians (*n* = 62), 38% as freelancers (*n* = 54), and 19% as postgraduate students in performance practice (*n* = 28). Of the 43% of participants who reported being orchestral players 52% (*n* = 30) worked in a symphony or philharmonic orchestra, 45% (*n* = 26) were pit musicians and 3% (*n* = 2) were string or chamber musicians. Of the sample working in symphonic/philharmonic or pit orchestras (*n* = 56, 97%), the largest number of musicians were section players (*n* = 24, 41%), followed by principals (*n* = 18, 31%), sub-principals (*n* = 10, 17%), co-principals (*n* = 3, 5%), leaders (*n* = 2, 3%) and co-leaders (*n* = 1, 2%).

The number of years participants worked as professional full-time orchestral musicians ranged between 1 and 55 years (mean = 20.7, *SD* = 11.5). Prior to COVID-19 symphony/philharmonic musicians and pit orchestral members reported spending up to a maximum of 180 minutes (mean = 87.9, *SD* = 44.8) in daily practice. The minimum rehearsal time for symphony/philharmonic musicians ranged between 150-360 minutes (mean = 280, *SD* = 67.0), while that of pit musicians ranged from 120-420 minutes (mean = 218, *SD* = 75.2).

Participants identifying primarily as freelancers had spent between 1 to 51 years (mean = 18.4, *SD* = 13.6) freelancing. Practice time ranged between 30 minutes to 300 minutes daily (mean = 151, *SD* = 74.1). At the time of data collection 43% (*n* = 23) of freelancers were looking for a full-time post, 4% (*n* = 2) were on trial for a full-time orchestral position while 24% (*n* = 13) were preparing for auditions. Postgraduate students reported practising between 120-420 minutes (mean = 220, *SD* = 80.0) daily, and in a typical year pre-COVID-19, performing between 2-30 performances and preparing for a maximum of 10 auditions.

The majority of respondents rated their general health positively with 81% (*n* = 116) rating it “very good” or “good”. This was followed by 17% (*n* = 24) of respondents reporting fair health, 2% (n = 3) bad or very bad health. Two thirds of participants (66%, n = 95) did not report chronic health conditions. Mental health and chronic pain each made up 22% of the chronic health issues reported, while chronic respiratory diseases made up 14%, cardiovascular disease 8%, and cancer 2%. Other chronic diseases reported included arthritis, neurological conditions, genetic vascular disease, diabetes, glaucoma, musculoskeletal illness, tendinitis, thyroid, pre-menstrual dysphoric disorder, and HIV.

6.2.4 Analysis

Statistical analyses were performed using the statistical package Jamovi (version 2.3.21.0). Data were first analysed using descriptive statistics to provide an overview of general patterns across professional musicians such as type of work, hours of practice and rehearsal, general health, perceptions of physical fitness, mental and social wellbeing, and social connectedness. The Shapiro-Wilk test was used to test for normality. Results indicated that the scores for some variables showed significant deviations from normality ($p < .05$). Skew values varied from .455 to .702. Kurtosis values also varied between -.738 to .0187. Histograms and q-q plots were also consulted. As both of these confirmed a non-normal distribution of data, it was concluded that the data set within this study showed significant deviations from normality. Thus, inferential statistics were run using non-parametric tests.

The Wilcoxon signed-rank test was conducted to compare means between participants' engagement in physical activity during and pre-COVID-19. The Kruskal-Wallis Test was used to examine the difference in means between perceptions of physical activity in type of musician both during and pre-COVID-19. DSCF pairwise comparisons were then run to test where the differences between musician groups lied.

A correlation matrix was created to explore the relationships between the outcome variables of health and wellbeing, physical activity during COVID-19, physical activity pre-COVID-19, depression, social connectedness, loneliness, and impact of physical exercise on performance. Since tests for normality of distribution showed that the total scores for depression (CES-D) and loneliness (UCLA Three-Item Loneliness Scale) showed significant deviations from normality (Shapiro-Wilk $p < .01$) Spearman's rank-order correlation coefficients were calculated. Correlation matrixes were also run to explore the relationships between other variables such as general health and wellbeing, physical activity pre- and during COVID-19, number of auditions prepared for annually and impact of physical exercise on performance. Contingency tables and chi-square tests of independence were run to further specify the relationships between demographics, musical experience and outcome measures.

Free-response text comments were also extracted from the survey. Given that only a small number of participants provided comments and that the information supplied was brief, the text analysis was conducted by hand, grouping comments into themes.

6.3 RESULTS

6.3.1 (RQ4) Perceptions of physical fitness during and pre-COVID-19

This section considers whether physical fitness was reported as similar pre- and during COVID-19.

During COVID-19, just over half of professional musicians (56%, *n* = 78) scored a high level of physical activity. This means that participants reported engaging in either (1) a vigorous intensity activity on at least 3 days achieving a minimum total of 1500 Metabolic Equivalent of Task (MET) minutes a week, or (2) 7 or more days a week in any combination of walking, moderate or vigorous intensity activities achieving a minimum total of at least 3000 MET minutes. This was followed by 36% (*n* = 51) of respondents who scored a moderate level of physical activity meaning that participants engaged in either (1) 3 or more days of vigorous intensity activity and/or walking for at least 30 minutes per day, or (2) 5 or more days of moderate intensity activity and/or walking of at least 30 minutes per day, or (3) 5 or more days of any combination of walking, moderate intensity, vigorous intensity activities resulting in a minimum total of at least 600 MET minutes per week. Eight percent (*n* = 11) of participants scored a low level of physical activity.

When examining the scores for the retrospective pre-COVID-19 assessment, the same pattern emerged; the largest number of participants (52%) scored a high level of physical activity, followed by 31% of participants scoring a medium level of physical activity, and the smallest number of participants (18%) scoring a low level of physical activity. Table 6.1 shows participants' perceived level of physical activity both during and pre-COVID-19 which showed no significant change.

Table 6.1 Percentage of participants' self-reported levels of physical activity during and pre-COVID-19.

Physical Activity	During COVID-19 % (*n* = 140)	Pre-COVID-19 % (*n* = 126)
Low	7.9 (11)	17.5 (22)
Medium	36.4 (51)	31.0 (39)
High	55.7 (78)	51.6 (65)

χ^2 *(4, N = 90) = 7.35, p = .119*

Table 6.2 shows musician type and perceived level of physical activity during COVID-19 and Table 6.3 shows this pre-COVID-19. During COVID-19, it can be seen that rates of high physical activity were similar across musician type (rates of 50% - 58%). However low physical activity did tend to be most common amongst postgraduate students (15.3%) compared with 10% in orchestral musicians and only 1.8% in freelancers. This trend was not statistically significant. Pre-COVID-19, the differences between self-reported levels of physical activity were less evident and again not statistically significant.

Table 6.2 Percentage of musician type and their self-reported levels of physical activity during COVID-19.

Physical activity	Orchestral musicians (*n* = 60)	Freelance musicians (*n* = 54)	Postgraduate students (*n* = 26)
Low	10 (6)	1.8 (1)	15.3 (4)
Medium	31.6 (19)	42.5 (23)	34.6 (9)
High	58 (35)	55.5 (30)	50 (13)

χ^2 *(4, N = 140) = 5.89, p = .207)*

Table 6.3 Percentage of musician type and their self-reported levels of physical activity pre-COVID-19.

Physical activity	Orchestral musicians (*n* = 53)	Freelance musicians (*n* = 50)	Postgraduate students (*n* = 23)
Low	15 (8)	18 (9)	21.7 (5)
Medium	35.8 (19)	26 (13)	30.4 (7)
High	49 (26)	56 (28)	47.8 (11)

χ^2 *(4, N = 126) = 1.55, p = .819)*

Levels of physical activity were then examined for mean differences pre- and during Covid-19 in the sample as a whole using the full continuous scale (see Table 6.4). The mean, *SD* and Wilcoxon signed-rank test statistic for each level of PA covered by the IPAQ-SF for all professional musicians can also be seen in Table 6.4 below for both during and pre-

COVID-19. The highest mean for days per week of vigorous PA was reported pre-COVID-19 where participants reported a mean of 2.5 days as opposed to a mean of 2 days during COVID-19 (*p* <.049). However, the difference in means (5.43 pre-COVID-19, 5.16 during COVID-19, *p* = .04) spent walking per week was in the opposite direction, indicating that professional musicians spent more time walking during COVID-19 than they did pre-pandemic. The analysis also showed that professional musicians spent more time sitting during COVID-19 than they did pre-pandemic (366 minutes versus 344, *p* = .04). Other indicators such as the sum of vigorous or moderate PA or of walking showed no significant differences.

Table 6.4 IPAQ-SF: means (SDs) and Wilcoxon signed-rank test statistic of vigorous and moderate PA, walking and sitting (days, minutes per week) during and pre-COVID 19 for professional musicians.

Variable	**During COVID-19** (*n* = 140) Mean (*SD*)	**Pre-COVID-19** (*n* = 126) Mean (*SD*)	***W* statistic**
Days vigorous PA	2.06 (1.97)	2.50 (2.07)	*W* = 675, *p* = .049*
Sum vigorous PA (mins)	68.1 (50.1)	71.3 (42.8)	*W* = 212, *p* = .479
Days moderate PA	2.74 (2.35)	2.89 (2.33)	*W* = 752, *p* = .078
Sum moderate PA (mins)	62.1 (51.4)	59.2 (39.0)	*W* = 408, *p* = .590
Days walking for at least 10mins	5.43 (2.13)	5.16 (2.43)	*W* = 562, *p* = .040*
Sum walking (mins)	68.5 (50.6)	68.4 (49.1)	*W* = 826, *p* = .476
Sum sitting (mins)	366 (168)	344 (158)	*W* = 978, *p* = .041*

*IPAQ – International Physical Activity Questionnaire; IPAQ-SF – short (last 7 days); SD – standard deviation; PA - physical activity; W – Wilcoxon signed-rank test statistic; *statistically significant.*

Table 6.5 shows the mean, *SD* and the Kruskal-Wallis statistic for each level of PA covered by the IPAQ-SF for all types of musicians – orchestral, freelance and postgraduate students - during COVID 19. The highest mean for days per week of vigorous PA was slightly higher in orchestral musicians but all types of musicians averaged 2 days a week. Regarding minutes of vigorous PA, postgraduate students ranked first (79.1 mins week-1), followed by freelancers (68.4 mins week-1) and orchestral musicians (63.8 mins week-1). Orchestral musicians had the highest mean for days per week of moderate PA averaging 3 days a week, followed by freelancers who reported a mean of 2.5, and postgraduate students averaging 2 days per week. The DSCF pairwise comparisons test showed that the mean for days per week of moderate PA in orchestral musicians was significantly higher than that in postgraduate students (p = .024). As regards minutes spent in moderate PA, freelance musicians reported the highest mean (67.1 mins week-1), followed by orchestral musicians (59.4 mins week-1) and postgraduate students (57.9 mins week-1). The mean for days per week spent walking was of 5.5 days for freelancers and postgraduates, and 5 days for orchestral musicians. Regarding mean of minutes spent walking, freelancers reported the highest mean (67.1 mins week-1) while postgraduates reported the lowest (60.2 mins week-1). Postgraduate students showed the highest mean in the sitting category, sitting on average for 398 minutes during the week and at the weekend. The lowest mean for sitting was reported by orchestral musicians (346 minutes). However, these were not statistically significant trends.

Table 6.5 IPAQ-SF: means (SDs) of days and H statistic of vigorous and moderate PA, walking and sitting (days, minutes per week) for types of professional musicians during COVID-19.

Variable	**Orchestral musicians** (n = 60) Mean (*SD*)	**Freelance musicians** (n = 54) Mean (*SD*)	**Postgraduate students** (n = 26) Mean (*SD*)	***H* statistic**
Days vigorous PA	2.25 (1.99)	1.94 (1.86)	1.85 (2.18)	H (2) = 1.513, p = .469
Sum vigorous PA (mins)	63.8 (41.0)	68.4 (51.3)	79.1 (69.1)	H (2) = .934, p = .627
Days moderate PA	3.28 (2.24)	2.52 (2.36)	1.96 (2.34)	H (2) = 7.427, p = .024*
Sum moderate PA (mins)	59.4 (52.7)	67.1 (55.5)	57.9 (33.1)	H (2) = 1.172, p = .557
Days walking for at least 10mins	5.10 (2.33)	5.72 (2.10)	5.60 (1.55)	H (2) = 4.336, p = .114
Sum walking (mins)	66.0 (59.8)	75.1 (43.7)	60.2 (40.6)	H (2) = 5.074, p = .079
Sum sitting (mins)	346 (136)	373 (182)	398 (201)	H (2) = 1.235, p = .539

*IPAQ – International Physical Activity Questionnaire; IPAQ-SF – short (last 7 days); SD – standard deviation; PA - physical activity; H – Kruskal-Wallis; *statistically significant.*

The mean, *SD* and the Kruskal-Wallis statistic for each level of PA covered by the IPAQ-SF for orchestral, freelance and postgraduate musicians pre-COVID-19 are reported in Table 6.6 below. Although none of these results showed statistically significant differences it is worthwhile noting that while orchestral musicians and postgraduate students reported the same mean of 2 days per week of vigorous PA both during and pre-COVID-19, freelancers reported a decrease in mean from 3 days per week pre-COVID-19 to 2 days during COVID-

19. The ranking for minutes of vigorous PA was similar with freelancers ranking first (81.6 mins week-1) and postgraduates ranking last (56.5 mins week-1). As in the results shown during COVID-19, orchestral musicians reported the highest mean for days per week of moderate PA (3 days) pre-COVID-19. The lowest mean belonged to freelancers reporting 2.5 days per week of moderate PA. Interestingly, results were inversed for minutes spent in moderate PA with freelancers reporting the highest mean (65.3 mins week-1) and orchestral musicians the lowest (53.2 mins week-1). The highest mean for days per week spent walking was reported by postgraduate students (6 days). However, freelancers reported the highest mean of minutes spent walking (72.9 mins week-1) while postgraduates reported the lowest mean (65.5 mins week-1). As in the results shown for during COVID-19, postgraduate students reported the highest mean in sitting, averaging 413 minutes. It is interesting to note that this mean was higher than the mean reported during COVID-19 (398 minutes).

Table 6.6 IPAQ-SF: means (SDs) and KW statistic of days of vigorous and moderate PA, walking and sitting (days, minutes per week) for types of professional musicians pre-COVID-19.

Variable	**Orchestral musicians** (n = 53) Mean (SD)	**Freelance musicians** (n = 50) Mean (SD)	**Postgraduate students** (n = 23) Mean (SD)	***H* statistic**
Days vigorous PA	2.39 (1.91)	2.75 (2.26)	2.20 (2.02)	H (2) = 1.037, p = .596
Sum vigorous PA (mins)	67.8 (38.4)	81.6 (51.7)	56.5 (23.0)	H (2) = 2.028, p = .363
Days moderate PA	3.24 (2.31)	2.55 (2.33)	2.80 (2.38)	H (2) = 2.089, p = .352
Sum moderate PA (mins)	53.2 (28.2)	65.3 (47.6)	63.0 (44.6)	H (2) = 0.574, p = .750
Days walking for at least 10mins	4.92 (2.58)	5.09 (2.53)	5.90 (1.65)	H (2) = 1.469, p = .480
Sum walking (mins)	65.8 (47.4)	72.9 (51.0)	65.5 (51.0)	H (2) = 0.241, p = .887
Sum sitting (mins)	334 (127)	326 (161)	413 (206)	H (2) = 4.020, p = .134

IPAQ – International Physical Activity Questionnaire; IPAQ-SF – short (last 7 days); SD – standard deviation; PA - physical activity; H – Kruskal-Wallis.

Table 6.7 and Table 6.8 below show means, SDs, medians and the Kruskal-Wallis statistic for MET PA/PE per week for all types of musicians for vigorous and moderate PA/PE, and walking, during and pre-COVID-19. The highest mean for Sum MET PA/PE during COVID-19 was reported for postgraduate students (3753) while freelance musicians reported the highest mean pre-COVID-19 (3433). Orchestral musicians reported the lowest mean during

COVID-19 (3138) while postgraduates showed the lowest mean pre-COVID-19 (2641). As regards medians, 50% of all musicians reported 2970METs per week during COVID-19 while prior to COVID-19 50% of musicians reported 2538 METs per week. The Kruskal-Wallis statistic showed a significant difference between means for MET minutes spent walking during COVID-19. The DSCF pairwise comparisons test, however, showed that there was no real significance between types of musicians despite the difference between postgraduates and orchestral musicians in MET minutes spent walking per week was almost significant (p = .052). The Wilcoxon signed-rank test statistic showed that the caloric expenditure of professional musicians during COVID-19 was significantly higher than pre-pandemic (W = 153, p = <.001).

Table 6.7 IPAQ-SF: means, SDs and H statistic of caloric expenditure (MET) per week for vigorous and moderate PA, and walking for types of professional musicians during COVID-19.

	All musicians (n = 140) Mean (SD)	**Orchestral musicians** (n = 60) Mean (SD)	**Freelance musicians** (n = 54) Mean (SD)	**Postgraduate students** (n = 26) Mean (SD)	***H* statistic**
Vigorous PA	1088 (1402)	1130 (1275)	984 (1261)	1201 (1903)	H (2) = 1.286, p = .526
Moderate PA	745 (929)	749 (740)	779 (1037)	665 (1104)	H (2) = 2.743, p = .254
Walking	1494 (1228)	1264 (1268)	1608 (1154)	1802 (1232)	H (2) = 7.304, p = .026*
Total PA/PE	3339 (2094)	3138 (1858)	3371 (2110)	3753 (2571)	H (2) = 0.674, p = .714

*IPAQ – International Physical Activity Questionnaire; IPAQ-SF – short (last 7 days); SD – standard deviation; PA - physical activity; H – Kruskal-Wallis; *statistically significant.*

Table 6.8 IPAQ-SF: means, SDs and KW statistic of caloric expenditure (MET) per week for vigorous and moderate PA, and walking for types of professional musicians pre-COVID-19.

	All musicians (n = 126) Mean (SD)	**Orchestral musicians** (n = 53) Mean (SD)	**Freelance musicians** (n = 50) Mean (SD)	**Postgraduate students** (n = 23) Mean (SD)	***H* statistic**
Vigorous PA	1326 (1869)	1204 (1368)	1628 (2440)	918 (1217)	H (2) = 1.182, p = .554
Moderate PA	608 (760)	634 (634)	573 (858)	627 (819)	H (2) = 2.353, p = .308
Walking	1071 (1063)	1022 (1033)	1112 (1141)	1096 (995)	H (2) = 0.234, p = .889
Total PA/PE	3057 (2556)	2883 (2092)	3433 (3112)	2641 (2152)	H (2) = 0.584, p = .747

IPAQ – International Physical Activity Questionnaire; IPAQ-SF – short (last 7 days); SD – standard deviation; PA - physical activity; H – Kruskal-Wallis.

Figure 6.1 below shows participants' weekly engagement in PA/PE pre- and during COVID-19 as compared to the recommended weekly limits of 500-1000 MET-minutes spent in PA/PE (Office of Disease Prevention and Health Promotion, 2008; Sylvia et al., 2014; Kahlmeier et al., 2015). Walking was the most frequent activity, followed by vigorous and moderate PA.

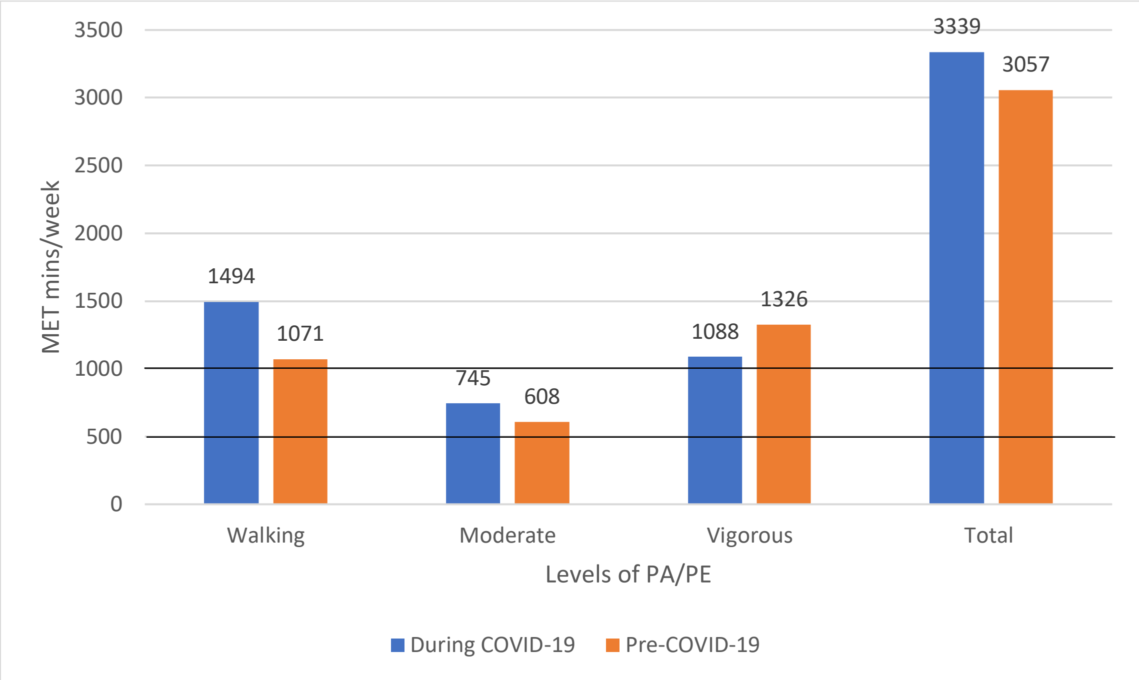

Figure 6.1 Weekly physical activity during and pre-COVID-19 according to the recommendations of 500-1000 MET-mins per week.

6.3.2 (RQ5) Physical activity and exercise in professional musicians

6.3.2.1 PA/PE as part of the daily/weekly routine

Fifty-three percent of participants (n = 52) stated that in their years as undergraduate music students they engaged in physical exercise or sport as part of their daily/weekly routine. Of these 52 who engaged in physical exercise, 21 reported doing so deliberately to help with performance. Of these 21, 15 stated that they did so either "very frequently" (n = 12) or "always" (n = 3). Three reported doing so "occasionally" while two participants stated that they either did so "rarely" or "very rarely" (n = 1). Participants reported using PA/PE to mostly enhance solo performances (n = 17). This was followed by auditions (n = 15), practical music examinations (n = 12), orchestral performances (n = 11) and chamber/duo performances (n = 9). Participants also added that they used PA/PE for recordings (n = 2), interviews (n = 1), and performances that required stamina (n = 1). The open responses showed that the reasons given by participants for their deliberate use of PA/PE to help with performance were to relieve stress and enhance relaxation (*n* = 12), manage performance anxiety (*n* =3), improve body and playing efficiency (*n* = 3), relieve muscle tension (*n* = 3), increase stamina (*n* = 3), energize themselves before performance (*n* = 3), enhance good mood (*n* = 3), and to feel good (*n* = 3).

As current professional musicians, 74% (*n* = 73) of participants reported engaging in PA/PE in their daily/weekly routine pre-COVID-19. Of these, 37 participants reported exercising whenever they could slot it in during the day, 29 reported exercising in the morning, 15 in the evening, and 11 in the afternoon. Among the reasons participants gave for their selected time slot was individual preference due to habit and/or timetable limitations (*n* = 18). Participants stated that exercising in the morning energized them for the rest of their day (*n* = 8) and helped them with stiffness and flexibility (*n* = 2). Others stated that engaging in PA/PE in the evening helped them relax and sleep better (*n* = 2) as well as helped them regain flexibility after a long day rehearsing and performing (*n* = 1).

Endurance was the type of PA/PE that participants engaged in the most (*n* = 61). This was followed by flexibility (*n* = 45), strength (*n* = 37), and balance (*n* = 10). The preferred level of intensity at which participants engaged in PA/PE was moderate exercise (*n* = 54), followed by vigorous (*n* = 30) and light exercise (*n* = 16). Running was the most popular type of endurance training (*n* = 34), while yoga was the type of exercise which ranked the highest for flexibility and balance, whereas lifting weights was the exercise choice for strength training (*n* = 15). Participants (*n* = 16) also reported engaging in a variety of team sports such as volleyball, cricket and soccer. Figure 6.2 below shows the different types of physical exercise participants engaged in.

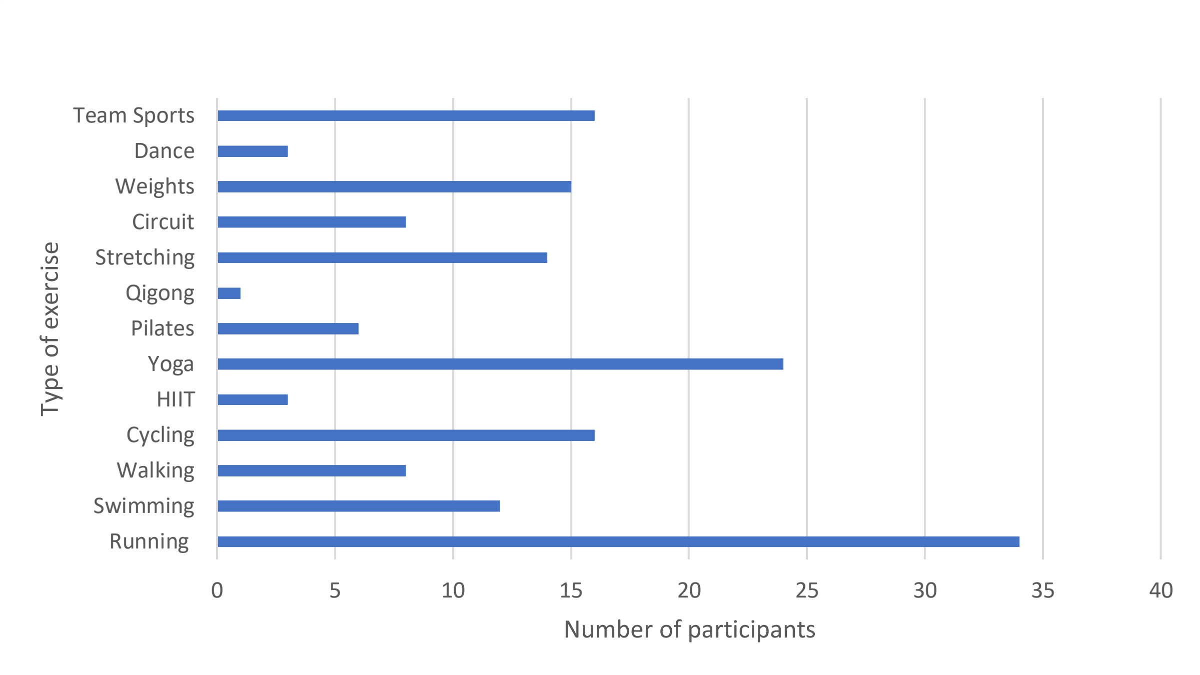

Figure 6.2 Type of exercise engaged in by professional musicians.

The main reason musicians gave for their engagement in PA/PE was to maintain or improve their physical health (*n* = 22). Other reasons included the element of fun in doing PA/PE (*n* = 8) and in engaging in PA/PE for performance purposes. One participant stated that they practised swimming "concentrating on strokes that can alleviate injury in string players" while following a "resistance weights programme related to both swimming and viola playing created by exercise physiologists and physios". Figure 6.3 below shows participants' reasons for engaging in PA/PE.

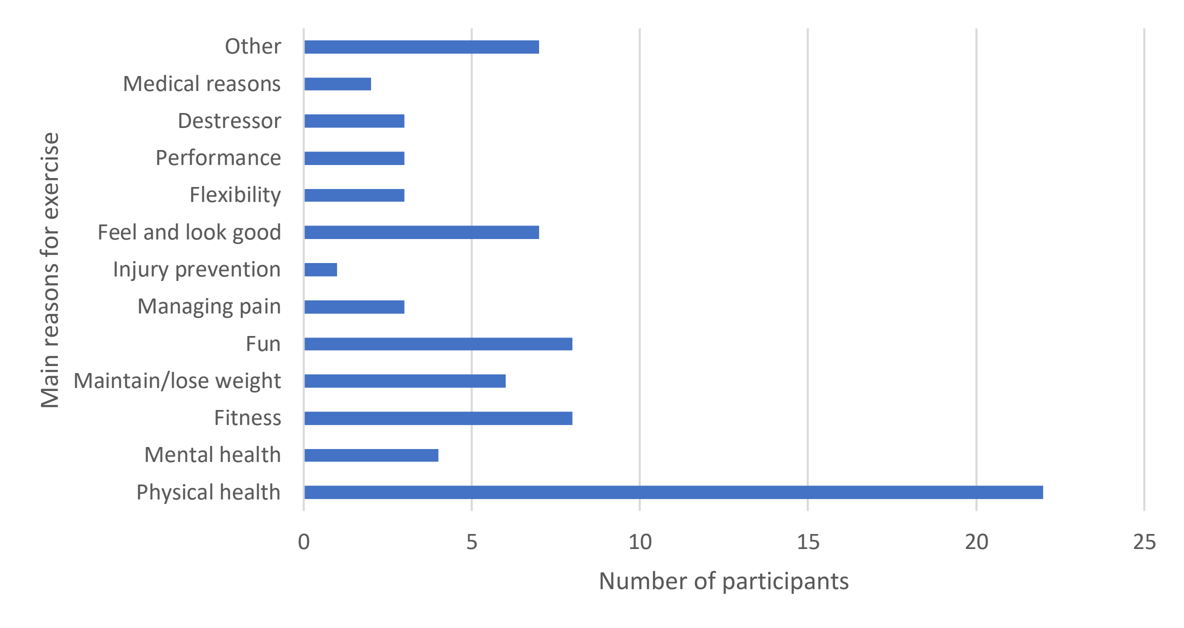

Figure 6.3 Professional musicians' main reasons for PA/PE.

However, participants also claimed that they did not always maintain their daily/weekly PA/PE on the day of performance. For each performance scenario the highest percentage of participants was as follows: 26% (*n* = 19) maintained their bout of PA/PE "very often" on the day of orchestral performance, 30% (*n* = 22) only did so "sometimes" on the day of chamber/duo performances, 22% (*n* = 16) "rarely" engaged in PA/PE on the day of audition, and 24% (*n* = 17) "never" did so on the day of solo performance. Figure 6.4 shows the frequency with which professional musicians maintained their daily/weekly routine of PA/PE depending on the type of performance scenario. Although the open responses collected for the frequency of PA/PE on the day of performance were few, Table 6.9 provides a summary.

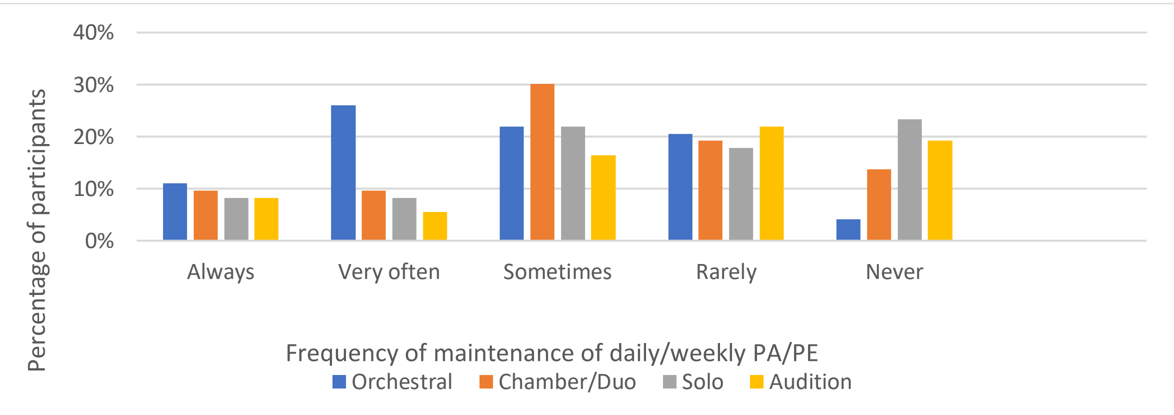

Figure 6.4 Frequency of maintenance of daily/weekly PA/PE according to type of performance scenario.

Table 6.9 Participants' reasons for frequency of PA/PE on the day of performance.

	Orchestral	Chamber/Duo	Solo	Audition
Always	- to improve concentration (*n* = 2) - to keep fitness levels (*n* = 1) - to stretch (*n* = 1)	- to stretch (*n* = 1) - to concentrate (*n* = 1) - to destress (*n* =1)		
Very often	- part of the routine (*n* = 5) - to clear the mind (*n* =1) - depends on timetable (*n* = 1)	- part of the routine (*n* = 2)	- timetable restrictions (*n* = 1)	- part of the routine (*n* = 1)
Occasionally		- to help with music performance anxiety (*n* = 1) - timetable restrictions (*n* = 1)	- to help with music performance anxiety (*n* = 1)	- to help with music performance anxiety (*n* = 1) - to conserve energy (*n* = 1) - too anxious to exercise (*n* = 1)
Very rarely		- to avoid adverse impact on performance (*n* = 1) - not to distract oneself from performance (*n* = 1)	- to avoid adverse impact on performance (*n* = 1) - not to overexert oneself (*n* = 1)	- not to distract oneself from performance (*n* = 2) - not to overexert oneself (*n* = 1) - to avoid adverse impact on performance (*n* = 1)
Never		- not to overexert oneself (n = 1)	- not to overexert oneself (n = 1)	- timetable restrictions (n = 2)

6.3.2.2 PA/PE on the day of performance

Sixty percent (*n* = 59) of professional musicians reported that they did not deliberately engage in PA/PE to help with performance. Out of the 40% that did, 24 participants stated that they did so "very frequently" (*n* = 19) or "always" (*n* = 5). Eleven did so "occasionally" while four participants reported doing so "rarely". Participants reported using PA/PE to mostly to enhance their orchestral performances (*n* = 25). This was followed by solo performances (*n* = 24), auditions (*n* = 20), chamber/duo performances (*n* = 18) and orchestral trial periods (n = 12). One participant also added that they used PA/PE to do well in interviews and one for marching bands. Figure 6.5 below shows the frequency with which PA/PE was used for performance enhancement purposes according to performance scenario between participants' own student days and professional status, reflecting number of participants in each scenario.

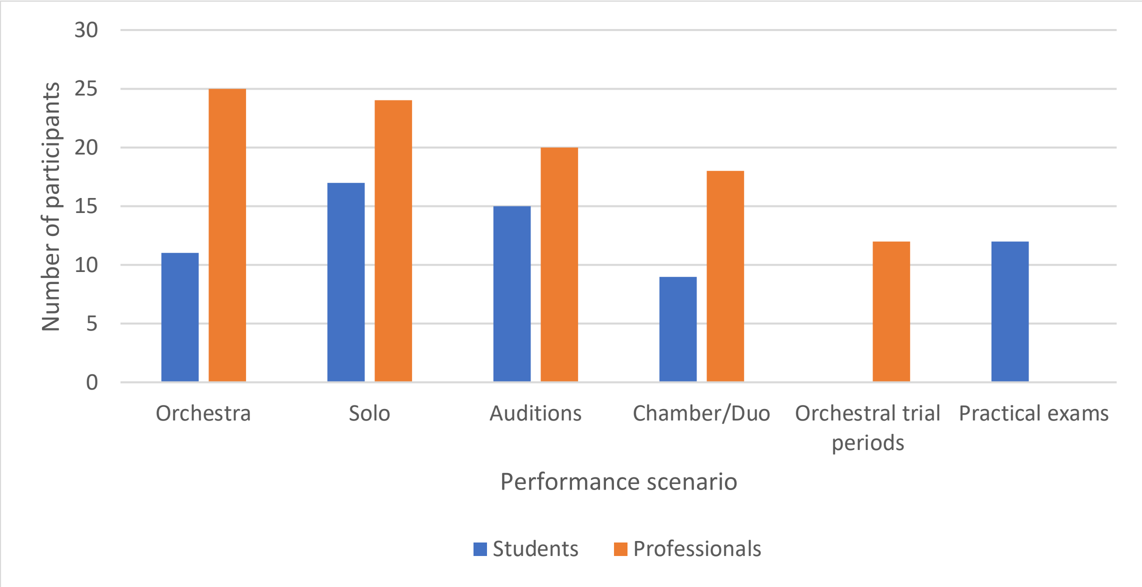

Figure 6.5 Number of participants engaging in PA/PE for performance enhancement purposes according to performance scenario between participants' own student days and their current professional status.

Participants were also asked to select the time of day in which they did deliberate physical exercise or sport with a view of enhancing performance on the day of performance. For auditions happening at various times along the day, the largest number of participants (n = 33) reported engaging in PA/PE in the morning. The same pattern emerged across all other performance scenarios where the majority of participants engaged in PA/PE in the morning. It is interesting to note that while these participants engaged in PA/PE to enhance performance, some chose to engage in PA/PE after performance. For auditions happening in the morning, for example, one participant reported doing PA/PE in the afternoon while four reported doing so in the evening. The same pattern also emerged across all other performance scenarios spanning auditions, trial orchestral performances, chamber/duo, solo and orchestral performances.

The highest number of participants (n = 14) reported that the type of preferred PA/PE on the day of audition was exercise targeting flexibility. This was also the case on days in which participants performed in chamber/duo (n = 14) settings. On the days of trial orchestral performances participants reported engaging equally in flexibility (*n* =8) and endurance exercises (*n* =8). This was also the case on the days of solo performance with participants engaging equally in flexibility (*n* =15) and endurance exercises (*n* =15). On the day of orchestral performance, the preferred type of exercise was endurance (*n* =19). Considering these results, it is not surprising that the choice of exercise most participants reported engaging in was yoga on the day of audition (*n* = 11) and chamber/duo (*n* = 10), yoga and running for trial orchestral performances (*n* = 6) and solo performance (*n* = 10) and running for orchestral performances (*n* = 10). Figure 6.6 shows the type of exercise engaged in by participants on the day of the various performance scenarios.

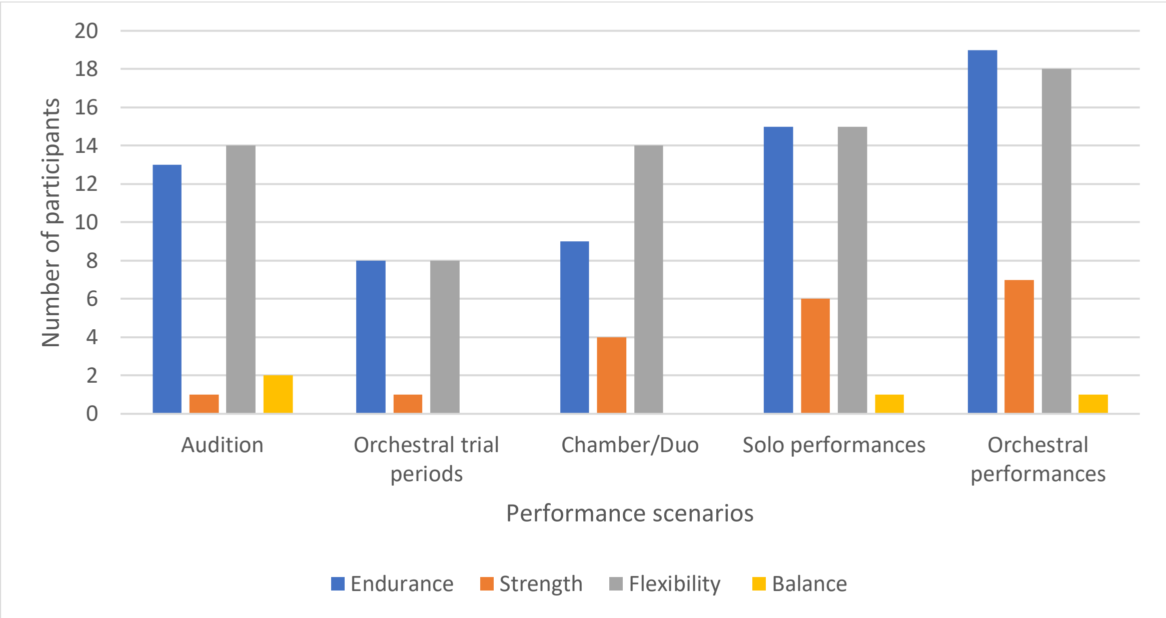

Figure 6.6 Type of PA/PE engaged in on the day of various performance scenarios.

It is interesting to note that the largest percentage of participants (60%, *n* = 59) stated that the deliberate PA/PE they engaged in prior to audition did not have an effect on performance. Another 10% (*n* = 10), however, stated that it might have had, and another 30% (*n* = 29) that it did have an effect on performance. This contrasts with the responses recorded for chamber/duo, solo and orchestral performances were all participants reported that PA/PE might have had or had an effect on performance. (Figure 6.7 shows participants' perceived effect of PA/PE on performance). The main effect PA/PE had on participants was relieving them of stress (*n* = 29). This was the case for the day of audition (*n* = 11), chamber/duo (*n* = 9), and solo performances (*n* = 9). On the day of orchestral trial performances, however, participants reported that their deliberate PA/PE helped in increasing concentration (*n* = 4), while on the day of orchestral performance it helped with enhancing stamina (*n* = 6).

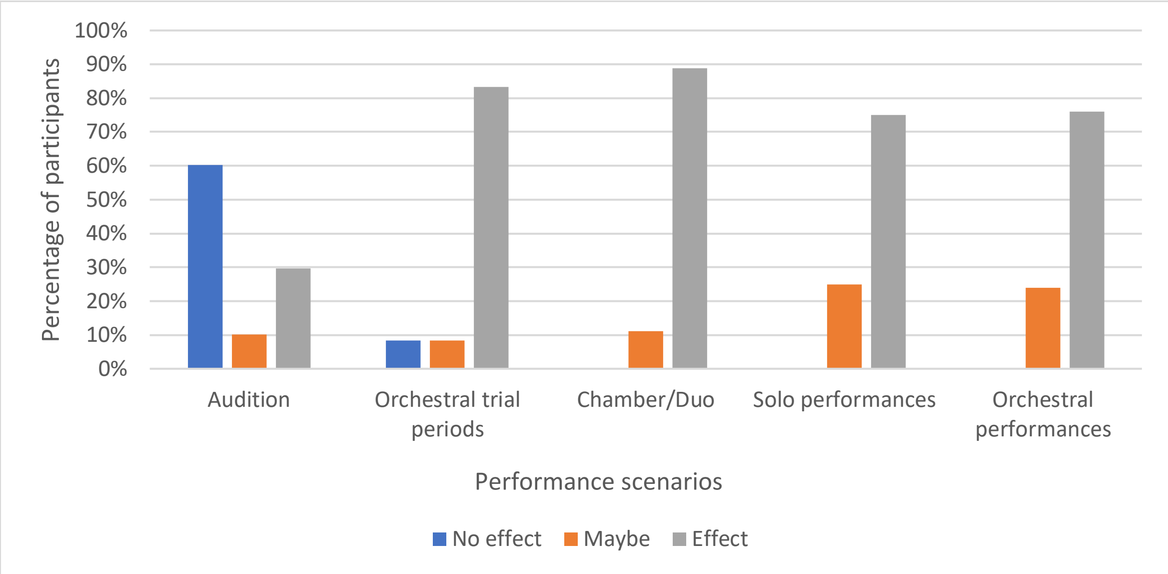

Figure 6.7 Participants' perceived effect of PA/PE on the various performance scenarios.

6.3.2.3 Professional musicians and training in PA/PE and performance

Seventy-eight (*n* = 76) percent of participants reported that they do not/have had no training on PA/PE and performance during their years as music students. Three quarters of participants (71%, *n* = 69), however, considered learning about the relationship between PA/PE and performance as very and/or extremely important, with 81% (*n* = 79) of respondents reporting that they would be interested in using PA/PE as part of a pre-performance routine. Participants reported that as a pre-performance routine, the performance scenario PA/PE would be most helpful in was solo performance (54%, *n* = 53), followed by audition (49%, *n* = 48), orchestral performance (46%, *n* = 45), chamber/duo (38%, *n* = 37), practical examinations (37%, *n* = 36), and orchestral trial periods (34%, *n* = 35). When asked about the likelihood of engaging in PA/PE prior to performance, respondents reported that they were extremely or somewhat likely to do so prior to solo performance (67%, *n* = 53). This was followed by orchestral performance (63%, *n* = 50), auditions (58%, *n* = 46), orchestral trial periods (57%, *n* = 45) and chamber/duo performances (57%, *n* = 45), and practical examinations (49%, *n* = 39). Figure 6.8 shows the likelihood of participants' engagement in PA/PE prior to performance.

Although the number of participants who gave reasons for their choices were very few, those who reported that it would be somewhat or extremely unlikely for them to engage in PA/PE prior to performance stated that they either "don't get that nervous" or "wouldn't want to feel tired afterwards". One participant stated that "if I were on trial, I would be nervous to try anything new and would also want to preserve every ounce of energy for the performance". However, the same participant also stated that "with chamber performances, I feel slightly less anxious, and so would be very up for doing some exercise beforehand to get the blood pumping!" Another respondent stated that engaging in PA/PE prior to chamber/duo performance "depends on the partner". With as regards to solo performances, one participant reported that they would perform exercise prior to performance "depending on the stamina and strength required for the performance". Regarding PA/PE prior to performance in orchestras, one participant stated that they would not engage in PA/PE "if there were many concerts in a row". Professional musicians also reported that the type of exercise they were most likely to engage in prior to performance was flexibility (63%, n = 62), followed by endurance (42%, n = 41), balance (29%, n = 28) and strength (20%, n = 20).

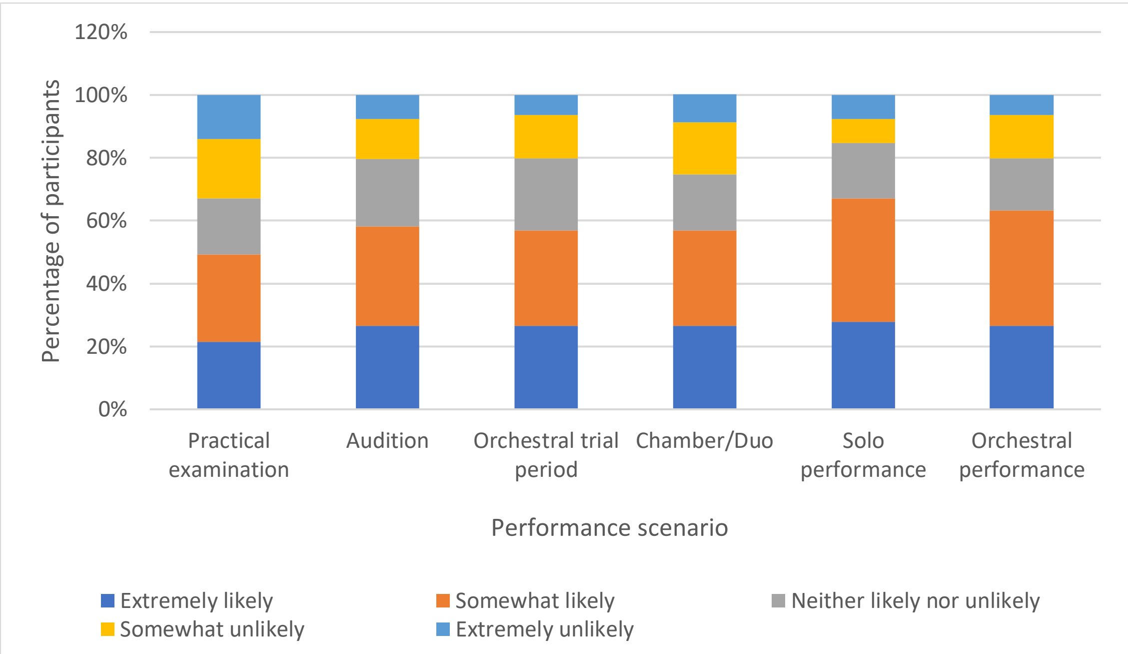

Figure 6.8 Participants' likelihood of engaging in PA/PE according to performance scenarios.

Considering the period of time in which the survey was launched, participants were also asked about whether they had any strategies that allowed them to develop their physical and mental skills to be ready to perform again after any time off or extended time away from performing, such as due to the COVID-19 pandemic. Most participants stated that they did not have any physical (60%, *n* = 59) or mental (66%, *n* = 65) skills to ease them into performance. Among the 39 participants (40%) stating having physical skills, 17 engaged in PA/PE. One participant stated that they engaged in PA/PE “to 'load' muscles progressively in practice and rehearsal when returning after a break, or 'tapering' before a performance or break”. Another stated that they did PA/PE “to strengthen areas prone to injuries as a result of performance”. Participants also stated that they eased back into performance through going over technical work such as scales and studies (*n* = 10), building stamina through chunking practice (*n* = 6), doing breath work (*n* = 6), simulating performance by “playing through/performing works without stopping” (*n* = 3), using Alexander technique (*n* = 3), personal warm-up exercises (*n* = 2) and taking care of posture (*n* = 2), relaxation exercises (*n* = 1) “as I always find I tense and overwork muscles (especially neck and fingers) when I am out of condition as a player”, nutrition (*n* = 1).

Among the participants (*n* = 33, 34%) stating having mental skills to ease them into performance, 13 simulated performance either by playing their instrument or through visualization. One participant stated doing so by "projecting myself mentally on stage in full details ‘living’ the performance before it happens”. Other mental skills included mental rehearsal (*n* = 1), meditation (*n* = 4), goal setting (*n* = 3), rest (*n* = 2), mindfulness (*n* = 2), practicing focus and concentration (*n* = 3), acceptance and commitment therapy (*n* = 1), psychological flexibility training (*n* = 1), and positive self-talk (*n* = 1). It is interesting to note, however, that some participants used the terms physical and mental skills interchangeably.

6.3.3 (RQ6) Perceived function of physical activity and exercise for wellbeing and on performance

According to the classification of scores in the MHC-SF scale, the largest number of participants reported “moderate” levels of wellbeing (61%, *n* = 88), whereas just above a fifth were “flourishing” (31%, *n* = 44), while only 8% (*n* = 12) were “languishing”. However, despite this wellbeing, it was also shown that three-quarters of the sample (73%) reported three or more depressive symptoms on the 8-item CDS-scale and therefore could be described as depressed (Karim et al., 2015). The mean score was 3.19 (out of 8; *SD* = 2.51). These results are in line with other research carried out during the first UK lockdown were 55% of participants reported “moderate” wellbeing, and 69% were described as depressed

(Spiro et al., 2021). This is a high level when compared to population norms. According to Evans et al. (2015) in 2014 19.7% of people in the UK aged 16 and over showed symptoms of anxiety or depression with this percentage being higher among females (22.5%) than males (16.8%).

The average score for social connectedness was 62.3 (*SD* = 14.4) on the 15-item Social Connectedness Scale-Revised which has a range of 15-90. Previous research shows that means for social connectedness with a much broader population were relatively close for the periods of time involving pre-COVID-19 - where the mean score was of 41.48 (*SD* = 15.49) (Tymoszuk et al., 2021) - and during the first lockdown where the mean score was of 48.56 (*SD* = 12.41) (Spiro et al., 2021). The current mean of 62.3 (*SD* = 14.4) shows higher social connectedness for the period of time between the first lifting of restrictions to well after all restrictions were removed. The largest number of participants (49%, *n* = 48) scored 66 or higher, 44% (*n* = 43) scored between 41-65, and only 7% (*n* = 7) scored lower than 40 on the 15-item Social Connectedness Scale-Revised. On the Three Item Loneliness Scale 39% (*n* = 38) scored 6 or higher out of 9 on the Three Item Loneliness Scale and were therefore classified as lonely (Steptoe et al., 2013) with an average score of 5.24 (*SD* = 1.84). The mean score of participants classified as lonely is very close to the mean of 5.12 (*SD* = 1.66) by Spiro et al. (2021).

Correlations (using Spearman's rho) were run between health and wellbeing, depression, loneliness, and social connectedness using the full continuous scales (see Table 6.10 below). All were significantly correlated. Health and wellbeing were negatively associated with depression and with loneliness, and positively associated with social connectedness as expected.

Table 6.10 Table showing the correlations between the variables for health and wellbeing.

	Health and wellbeing	**Depression**	**Social connectedness**	**Loneliness**
Health and wellbeing				
Spearman's rho	— — —	— — —	— — —	— — —
p-value	— — —	— — —	— — —	— — —
Depression				
Spearman's rho	-.657***	— — —	— — —	— — —
p-value	<.001	— — —	— — —	— — —
Social connectedness				
Spearman's rho	.652***	-.519***	— — —	— — —
p-value	<.001	<.001	— — —	— — —
Loneliness				
Spearman's rho	-.509***	-.553***	-.699***	— — —
p-value	<.001	<.001	<.001	— — —

Correlations were also run between perceived impact of PA/PE and other variables including demographics (age) and an aspect of musical experience (number of performances given annually), but no significant associations were found. Thus τb = -.07, p = .480 for age, τb = -.11, and τb = -.009, p = .957 for number of performances given annually.

Given that the variable of ‘type of musician’ is not amenable to correlation, contingency tables were formed to examine the specifics of the relationship between perceived impact of PA/PE and type of musician. However, contingency tables showed no significant differences between type of musician and perceived impact of PA/PE on audition (χ^2 (2, N = 98) = 2.96, p = .228) and perceived impact of PA/PE on trial orchestral performance (χ^2 (2, N = 12) = 1.53, p = .466). Despite there being no significant differences between perceived impact of PA/PE in these two performance scenarios and type of musician, freelancers showed the highest rate in reporting a positive perceived impact of PA/PE on audition (20.4%, 20/98) compared with the remaining 19.3% (19/98) of musicians, while orchestral musicians showed the highest rate in reporting a positive perceived impact of PA/PE on trial orchestral performance (50%, 6/12) compared to the remaining 41.7% (5/12) of musicians. Contingency tables also showed no significant differences between gender and perceived impact of PA/PE on audition (χ^2 (2, N = 98) = 2.63, p = .269). Despite the non-significant result between perceived impact of PA/PE on audition and gender, females showed the highest rate in reporting a positive perceived impact of PA/PE on audition (27.5%, 27/98) when compared to males (12.2%, 12/98).

Correlations were run between health and wellbeing, depression, loneliness, social connectedness, demographics (age) and musical experience (years spent as an orchestral musician) (see Table 6.11). Depression related to age and years spent in an orchestra.

Table 6.11 Table showing the correlations between the variables for mental and social wellbeing, age and musical experience.

	Age	Years spent as an orchestral musician
Health and wellbeing		
Spearman's rho	.116	.241
p-value	.168	.068
Depression		
Spearman's rho	-.189*	-.345**
p-value	.023	.008
Social connectedness		
Spearman's rho	-.123	.130
p-value	.227	.436
Loneliness		
Spearman's rho	.042	.170
p-value	.682	.306

Contingency tables were formed to examine differences between type of orchestra and type of musician, given these are nominal scales not amenable to correlation. The relationship between health and wellbeing and type of orchestra showed no significant differences (χ^2 (4, N = 58) = 6.64, p = .156), although symphony/philharmonic musicians showed the highest rate (24.1%, 14/58) in reporting a state of flourishing (high health and wellbeing), compared with (8.6%, 5/58) of remaining musicians. Pit musicians (34.4%, 20/58) were the highest percentage of orchestral musicians reporting a moderate state of wellbeing compared with 27.5% (16/58) of remaining musicians. When the relationship of years spent in an orchestra to depression was examined, no significant relationship emerged – 44.8% (26/58) of those playing for 11 years and over were classified as depressed compared to the 19% (11/58) who played for less than 11 years (χ^2 (4, N = 58) = 5.10, p = .277). Social connectedness was however significantly related to type of instrument played (χ^2 (6, N = 98) = 13.6, p = .035). The instrument groups scoring ‘low’ on the social connectedness scale were most often strings (28.5%, 28/98), and in particular, violinists (11.2%, 11/98). Those scoring ‘high’ were more likely to be brass (7.1%, 7/98) and percussion (7.1%, 7/98) versus 11.2% (11/98) of remainder of instruments.

As shown in Table 6.11, depression was negatively correlated with age, consistent with national rates. A contingency table was formed to examine specifics of the relationship between depression and gender, as gender is a nominal scale not amenable to correlation. This relationship did not show a significant difference (χ^2 (2, N = 144) = 1.89, p = .389) although depression was shown to be more common in females (47.2%, 68/144) compared to males (24.3%, 35/144) which is consistent with national rates. A significant difference was found between gender and age (χ^2 (8, N = 144) = 23.8, p = .002), with females more likely to be over age 41 (24.3%, 35/144) than males (20.1%, 29/144) or other (0.69%, 1/144). A significant difference was also found between gender and family of instruments (χ^2 (6, N = 144) = 15.9, p = .014) with the highest percentage of females playing string instruments (32.6%, 47/144) and the highest percentage of males playing brass and percussive instruments (19.4%, (28/144). The two participants identifying as transgender were between 21-30 and 61-75 years of age and played instruments pertaining to the string and brass family.

Age was examined in relation to type of orchestra and type of musician. It was shown that 39.6% (23/58) of musicians in symphony/philharmonic orchestras were over 41 years of age compared with 24.1% (14/58) of musicians in pit and string/chamber orchestras, which is just short of statistical significance (χ^2 (8, N = 58) = 14.6, p = .067). When type of orchestra was examined against number of years spent playing in orchestra, there was a non-significant trend for symphony/philharmonic orchestras to have a relatively high percentage of musicians (44.8%, 26/58) who have already worked in orchestras for over 11 years compared to 31% (18/58) from remaining orchestras (χ^2 (8, N = 58) = 15.0, p = .058). Type of musician was significantly related to age. Postgraduate musicians made up the highest percentage 17.4% (25/144) of musicians under 30 years of age compared with 12.5% (18/144) of orchestral musicians and freelancers (χ^2 (8, N = 144) = 64.5, p = <.001).

6.4 DISCUSSION

Perceptions of physical fitness during and pre-COVID-19 (RQ4)

Professional musicians' perceptions of their level of PA/PE showed that pre-COVID-19, 52% of participants exceeded the recommended weekly limits of 500-1000 MET-minutes spent in PA/PE (Office of Disease Prevention and Health Promotion, 2008; Sylvia et al., 2014; Kahlmeier et al., 2015), 31% met recommendations, while 18% did not meet recommendations. These results sit in between results from a study by Matei and Ginsborg (2020), which showed that 26% exceeded the recommended weekly limits, 70% met recommendations, and 4% did not, and results from a study by Araujo et al. (2020) which showed that 79% of participants exceeded the recommended weekly limits, 10% met recommendations, and 11% did not. Although these studies do not concern self-reports of PA in professional musicians they show self-reports of PA in undergraduate and postgraduate music students.

The current study also showed that participants' self-reports of their level of PA/PE changed during COVID-19 showing an overall increase in PA/PE during this time: 56% exceeded the recommended weekly limits of 500-1000 MET-minutes spent in PA/PE (Office of Disease Prevention and Health Promotion, 2008; Sylvia et al., 2014; Kahlmeier et al., 2015), 36% met recommendations, and 8% did not meet recommendations (refer to Figure 6.1 above).

According to Loyen et al. (2016) the percentage of people meeting the national guidelines for PA/PE in the UK ranges from 19% to 76% while the prevalence of physical inactivity varies between 2% and 71% in 51 countries worldwide according to Guthold et al. (2008). As Van Hecke et al. (2016) state, it can be said that these variations can be attributed, in part, to the use of self-report and of different methods of assessment which may impact results. The mean of 3057 MET-minutes weekly in the present study is slightly higher than the mean of 2543 reported in Loyen et al.'s study. During COVID-19 this mean increased to 3339 MET-minutes per week.

While the percentage of participants engaging in moderate and high levels of physical activity increased during COVID-19, only the increase in the number of days spent walking during the pandemic was found to be statistically significant. The mean for days spent engaging in vigorous PA, on the other hand, was found to be significantly higher pre-COVID-19. It may be assumed that the increase in days spent walking during COVID-19 was due, in part, to the social restrictions imposed on the population during the pandemic. However, for results dealing with the period of time prior to COVID-19, one must take into account potential inaccuracies due to recall bias. Fit Musician was launched in May 2021 and required participants to report on their engagement with PA/PE pre-pandemic, therefore requiring them to recall their engagement in PA/PE to 2 years prior, pre-March 2019.

The group of musicians whose percentage increased the most in levels of PA/PE from pre- to during COVID-19 were orchestral musicians and freelancers. While the percentage of postgraduate students during these two time periods remained relatively the same across PA/PE levels, the percentage of orchestral musicians increased the most for vigorous PA/PE from pre- to during COVID-19, while freelancers' percentage increased the most for moderate PA/PE. A possible explanation for this might be that during the pandemic, performing artists had more time to engage in PA/PE than they did pre-pandemic. Although due to their precarious conditions of work freelancers were among the worst affected during the pandemic, Dinardi et al. (2023) found that one of the coping strategies performing artists found during the pandemic was scheduled online and offline physical activity which they used as a means of organizing daily time (Dinardi et al., 2023).

Although this might explain the increase in levels of PA/PE during the two time points, it does not explain the interesting, yet statistically non-significant difference between levels in PA/PE and type of musician. However, it is worth pointing out that Table 6.2 and 6.3 show a recurrent pattern where engagement in low PA/PE pre-pandemic decreases during COVID-19 while engagement in moderate and vigorous levels increases during the pandemic. It therefore might be the case that professional musicians engaged in an incremental increase in levels of PA/PE changing from low levels of PA/PE pre-pandemic to moderate levels during COVID-19, and from moderate levels pre-COVID-19 to vigorous levels of PA/PE during the pandemic. Therefore freelancers - the largest group of musicians engaging in low levels of PA/PE pre-pandemic - shifted to being the largest group of musicians engaging in moderate levels of PA/PE during the pandemic, while orchestral musicians went from being the largest group engaging in moderate PA/PE pre-pandemic to the largest group of musicians engaging in vigorous levels of PA/PE during COVID-19. This study also showed that orchestral musicians were the largest group of musicians engaging in PA/PE. This might be due to the prevalence of PRMDs in the sector which is well documented in the literature (Middlestadt & Fishbein, 1988; Blum, 1995; Steinmetz et al., 2015a, 2015b).

Results also showed that the number of days orchestral musicians spent in moderate PA/PE during COVID-19 was significantly higher than that spent by postgraduate students. Although not a statistically significant result, postgraduate students scored the lowest means across all musicians for days spent engaging in vigorous and moderate PA/PE, while they scored the highest mean for minutes spent in vigorous PA and in minutes spent sitting per week. Interestingly, pre-COVID-19, postgraduates held the lowest mean for number of minutes spent in vigorous PA (918, *SD* = 1217). This mean is higher than that recorded for postgraduates in a previous study by Araujo et al. (2020) where number of minutes spent in vigorous PA was of 725 minutes (*SD* = 1344). As regards level of moderate PA, walking and total MET-minutes spent in PA, this study reports comparable, albeit slightly higher, PA levels to the levels reported by postgraduates in Araujo et al. (2020).

Physical activity and exercise in professional musicians (RQ5)

Results showed that professional musicians engaged more in PA/PE as professionals than as music students. Engaging in PA/PE whenever their timetable allowed them to, the majority of participants opted for endurance exercises and in particular, running, to maintain and/or improve general health. Although IPAQ results showed that the preferred level of PA/PE was walking, followed by vigorous and moderate PA/PE, Section 4 of Fit Musician showed that 54% of musicians engaged in moderate exercise. This highlights the observation by Kapteyn et al. (2018) who pointed out that participants disagree on what constitutes PA and do not clearly distinguish between moderate and vigorous intensities. Consequently, Kapteyn et al. (2018) argue that respondents may count the same activities twice as they believe both to constitute moderate and vigorous intensities.

As already seen in Chapter 4 and 5, participants reported that they did not always maintain their daily/weekly PA/PE on the day of performance. While on the day of orchestral performance the majority of participants maintained their PA/PE “very often”, on the day of chamber/duo performances the majority did so only “sometimes”, while on audition day participants did so “rarely”, and “never” on days of solo performance. This pattern might suggest that the more pressure-inducing a scenario is perceived as being, the less likely it is for performers to maintain their PA/PE on the day. Among the reasons participants gave for always and/or very often maintaining PA/PE on the day of performance was that it was simply part of their daily routine. Others, however, stated that they used PA/PE as a means of improving concentration for performance. Those reporting doing so only occasionally gave various reasons one of which being that PA/PE helped them with music performance anxiety. Participants stating that they very rarely or never maintained PA/PE on the day of performance reported doing so not to distract themselves and not to overexert themselves prior to performance. These findings consolidate results presented in Chapter 4 and Chapter 5.

Participants stating that their engagement in PA/PE on the day of performance was limited to routine was further highlighted by the majority of participants (60%) stating that they did not engage in PA/PE with a view of enhancing performance. The majority of those who did, however, did so always and/or very frequently. When compared to responses given about PA/PE and performance during their student days, professional musicians engaged in PA/PE to mostly help enhance orchestral and solo performances while as students most did so to enhance solo performances and auditions.

It is interesting to note that on the day of performance, despite engaging in PA/PE for performance purposes, some performers exercised after, and not prior to performance. Although the reasons for this varied from timetable restrictions to not wanting to overexert themselves prior to performance, it is unclear how these performers perceived PA/PE to benefit same day performances. As already pointed out in Chapter 4, it could be that participants might not have learnt how to use strategies for performance, or as Hays (2002) states, they might have learnt them ineffectively, or might not have truly understood their applicability or utility. Similarly, participants might have known about the benefits of PA/PE on general health but may not have learnt how it could benefit performance. This study shows, in fact, that 78% of participants have had/had no training in PA/PE and performance.

This study also showed that professional musicians' choice of type of PA/PE depended on the type of performance scenario. Whereas earlier results showed that the majority of musicians engaged in endurance exercise, on the day of audition and chamber/duo performances, for example, most participants reported engaging in flexibility exercises, practising yoga with a view of increasing flexibility before performance. For trial orchestral and solo performances most participants chose flexibility (mostly yoga) as well as endurance exercises (mostly running), while on the day of orchestral performances most musicians chose endurance (mostly running). It may be worth noting that on the day of performance, type of PA/PE changed according to how pressure-inducing a performance scenario was perceived as being.

Results also showed that professional musicians' choice of deliberate PA/PE was perceived as having had/might have had a positive effect on chamber/duo, solo and orchestral performances. However, the majority of participants reported that with regards to audition, the PA/PE engaged in was not perceived as having had an effect. While it is not surprising that participants engaging in PA/PE with a view of enhancing performance could be inclined to perceive it as having had an effect on performance, it is interesting to note what these effects were. On the day of audition, orchestral trial performances, chamber/duo and solo performances, for example, most participants perceived PA/PE as having helped them relieve stress prior to performance. On the day of orchestral performance, on the other hand, PA/PE was perceived as having helped with stamina.

As participants reporting no perceived effect of PA/PE on audition/orchestral trail performances gave no reasons for their answers, it is difficult to interpret how independent of expectations these were, or how independent they were of performance outcome. An observation that can be made, however, is that participants reporting no perceived effect of PA/PE on performance did so for performance scenarios which required a formal evaluation of their abilities by others, such as auditions and orchestral trial performances. In scenarios where formal validation was not part of the performance scenario, such as chamber/duo and solo performances, participants seemed more likely to report on the perceived positive effects of PA/PE on performance. It might also be interesting to point out that participants might have found it easier to report on the effects of PA/PE when their expectations of the effects of PA/PE concerned the physical aspect of performance, such as an increase in the desired stamina for orchestral performance. This might have proven more difficult when expectations concerned the psychological aspect of performance, such as managing music performance anxiety and enhancing concentration for pressure-inducing scenarios such as auditions and orchestral trial performance. This difficulty might have been due to the fact that as already stated in Chapter 4 and 5, some participants interchanged mental with physical strategies, and as already mentioned earlier, participants have not as yet learnt how to use strategies for performance then it becomes more difficult to select the right strategy to help target the desired effect.

However, research on how PA/PE can help optimise performance is scant and if knowledge is sparse than teachings are limited. Therefore, participants' response to whether deliberate PA/PE had an impact on their performance raises a number of questions which future research can help address. These include questions on chronic and acute exercise, on type of PA/PE, and the timeframe within which PA/PE could be done prior to performance. When planning such interventions, research will need to take on an ecological approach, also taking into account the different levels of fitness within musicians as well as the perceived pressure in performance scenarios.

Physical activity and exercise for wellbeing and performance (RQ6)

The COVID-19 pandemic, its lockdowns and associated quarantines have had a negative impact on health and wellbeing (Spiro et al., 2021). According to Fancourt et al. (2021), by the end of March 2020, 26% of adults in the UK had scores indicating moderate to severe symptoms of depression. During this time, a study by Spiro et al. (2021) investigating the effects of the first UK lockdown on all performing artists including musicians, showed that a much higher rate of 69% were classified as depressed, thus substantially higher than the general population. In addition Spiro and colleagues found 55% of participants reported moderate levels of wellbeing, 41% classified as lonely while the average score for social connectedness was of 48.56 (*SD* = 15.49). These rates are highly similar to those reported here. In *Fit Musician*, conducted after the third and last UK lockdown between the first lifting of restrictions to well after all restrictions were removed shows that 61% of professional musicians reported moderate levels of wellbeing, 73% were classified as depressed, 39% as lonely, while the average score for social connectedness was of 62.3 (*SD* 14.4). Figure 6.9 below shows mental and social wellbeing in performing artists during lockdown 1.0 as reported by Spiro and colleagues and professional musicians right after lockdown 3.0 in *Fit Musician* with similar rates.

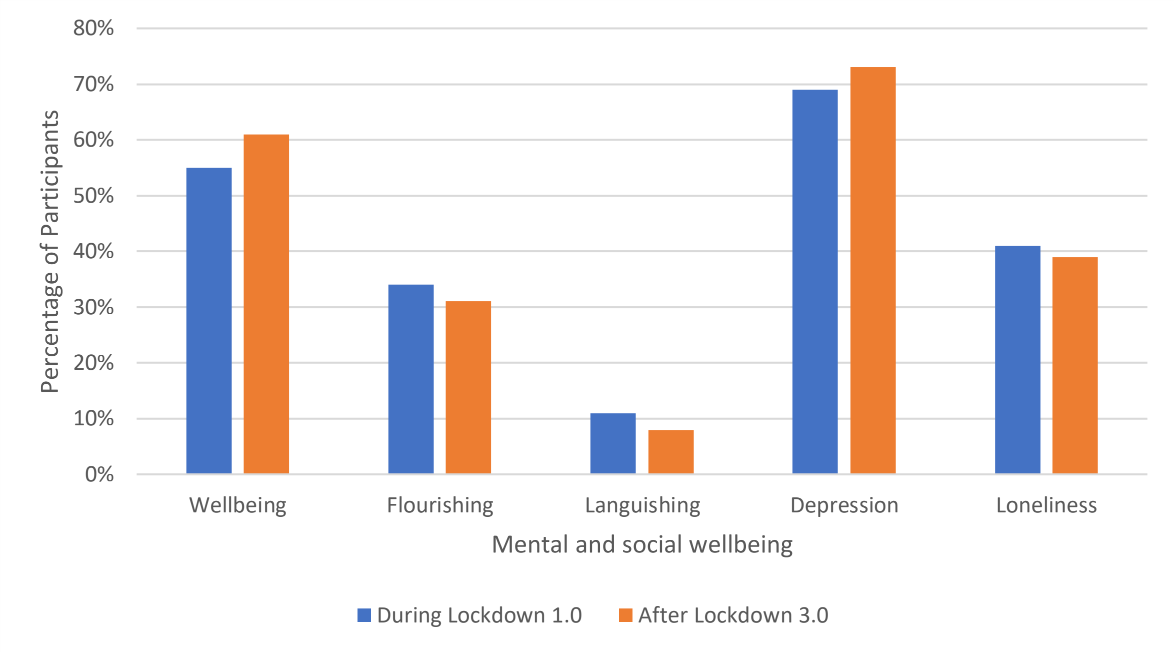

Figure 6.9 Mental and social wellbeing in the UK for performing artists during lockdown 1.0 (Spiro et al., 2021) as shown in blue and professional musicians after lockdown 3 (Fit Musician survey) shown in orange.

Thus similar results in mental and social wellbeing, as well as in the self-reported physical activity between this study and other research provides some corroboration for findings in *Fit Musician*. Contrary to what was expected, however, the present study showed no associations between PA/PE and wellbeing as reported in a study on the general population during COVID-19 (Wood et al., 2020), or on performing arts professionals during the pandemic (Spiro et al., 2021). This may be due to the specific psychological challenges of professional musicians, different to the general population and other arts professionals. According to Vaag et al. (2016), for example, the prevalence of psychological distress in musicians is higher than in the rest of the workforce, while Kenny et al. (2014) include anxiety and depression among the psychological challenges of orchestral musicians. Nonetheless, it might also be the case that by the third lockdown, general PA/PE might not have been enough to support professional musicians' wellbeing especially in cases where respondents had to live through cancelled contracts and no salary to provide financial security.

In the study reported here a significant difference was reported between gender and age with females making up the highest percentage of professional musicians over the age of 41 than males or other in this sample. A significant difference was also found between gender and family of instruments with females playing mostly string instruments and males playing both strings and brass. The analysis also showed that type of instrument played was related to better social outcome scores with brass and percussionists scoring higher in social connectedness than the rest of the instrument families. This is an interesting finding as little is still known on the interplay between genetics, choice of instrument and music specialisation.

As expected, age was correlated with depression, with younger professional musicians having higher scores in depression than older respondents. The association between depression and being younger is also very well documented in the research literature with first onsets occurring in late teenage years (Mojtabai et al., 2016). In the current context this is also highlighted in the literature in which COVID-19 has brought about an increase in depression and anxiety symptoms in young adults in particular (Hawes et al., 2021). Spiro et al. (2021) suggest that the association between depression and younger performing arts professionals during the first UK lockdown might have been due to older professionals perceiving COVID-19 as less of a threat than younger ones due to their more established careers and their greater financial stability. While acknowledging that COVID-19 has multifarious adverse effects on the general mental health of young adults, the association between depression and younger professional musicians in this study might also be due to the feelings of exacerbation that living in uncertainty and in precarious conditions might have gone well into and beyond the third UK lockdown.

Contrary to what was expected, there was no significant difference between gender and depression. The relationship between gender and depression is well known in the literature (Voltmer et al., 2012) and while there are various factors contributing to such gender differences (Albert, 2015) one aspect of this is due to women having higher domestic responsibilities which can conflict with work roles (Spiro et al., 2021). During the online interviews carried out for Study 2 (Chapters 4 and 5), for example, female respondents with children made frequent references to how both pre- and during the pandemic, their instrument practice, physical exercise and diet revolved around their children's timetable. All five interviewed females did, in fact, make reference to multiple domestic chores and obligations, while two out of six males made reference to domestic chores which limited them to taking the dog out for a walk (Participant 8) and decluttering their living space (Participant 10), while another two made reference to seeing their children off to school after their morning run and before they left off for work (Participant 3 and Participant 6). According to the Office for National Statistics (ONS) (2020), women took on childcare responsibilities during the pandemic, having less time to spend in paid work and spending more time on unpaid labour. It is therefore surprising that this is not reflected in the present result.

An interesting finding is the negative association between depression and years spent playing in orchestra. While research has shown that depression and anxiety are among the psychological challenges orchestral musicians face (Kenny et al., 2014), research also shows that the social aspect of making and sharing music contributes to wellbeing (Ascenso et al., 2017). It therefore may be said that the longer one works in orchestras where one makes and shares music with fellow musicians, the less likely it is for musicians to be depressed.

With regards to physical exercise and performance, no associations were found between IPAQ-SF (pre- and during COVID-19) and perceived impact on performance. Nonetheless, considering that this study showed that as many as 83% (116/140) of professional musicians either exceeded or met the recommended weekly requirements for PA/PE, and that 74% (73/98) engaged in PA/PE as part of their daily/weekly routine, it is evident that PA/PE is a large part of most musicians' daily/weekly routine. There may have been too little variation in this study to indicate a relationship between PA/PE and its perceived impact on performance. There is scope for future research to further investigate PA/PE in musicians using more varied measurement approaches and prospective designs. This is not only because physical exercise has been largely documented to have positive effects on health and wellbeing or because as Araujo et al. (2020) state, it is important to investigate if musicians' physical fitness is sufficient to meet the demands of the physical exertion required for rehearsals and performances.

Apart from showing that most professional musicians engage in PA/PE in their daily/weekly routine, this study also showed that 40% do so with a view of enhancing performance. Findings also pointed to an overwhelming large proportion of musicians (78%) reporting that they have had/have no training on PA/PE and performance, to three quarters of participants who consider that learning about PA/PE and performance is extremely important to their career, and to 81% stating that they would be interested in learning how to use PA/PE as part of a pre-performance routine. These findings indicate that it is worth investing in future research which investigates the effects of PA/PE on performance taking into account more parameters of context, experience and musical demands in order to better advise musicians on the best PA/PE as tailored to their needs.

Finally, this study has some limitations which may have influenced the findings. The study was cross-sectional which does not allow for objective investigation over time, nor did it have a control group to compare results with other non-musician groups. It also took place during a pandemic which may have distorted respondents' views, attitudes and emotions.

A limitation concerns the general issue of reporting bias in self-report surveys, with Hagstromer et al. (2010) specifically stating that IPAQ may be susceptible to bias and over-rating. Another concerns recall bias which might have had an effect on the estimation of PA/PE pre-COVID-19. Also the relatively modest sample size which can contribute to some non-significant results and Type I errors (Williamon et al., 2021). Finally, the documented online fatigue during the pandemic (Gregersen et al., 2023) which coupled with the length of Fit Musician might have contributed to response fatigue, might have lowered the reliability of answers towards the end of the survey.

6.5 SUMMARY

Study 3 aimed to investigate professional musicians' perception of their levels of physical fitness pre- and during COVID-19 as well as musicians' engagement in PA/PE. It also sought to explore the reasons behind the engagement in PA/PE and the functions professional musicians perceived physical activity and exercise to have for their wellbeing, general health and on their performance experiences.

Study 3 found that pre-COVID-19, 52% of professional musicians exceeded the recommended weekly limits of 500-1000 MET-minutes spent in PA/PE (Office of Disease Prevention and Health Promotion, 2008), 31% met recommendations and only 18% did not. During COVID-19 results showed an overall increase in PA/PE resulting in 56% of participants exceeding the recommended weekly limits, 36% meeting general recommendations, with only 8% who did not. For comparison, a study by Matei and Ginsborg (2020) showing that 26% of conservatoire students exceeded recommended weekly limits, 70% met recommendations and 4% did not, and a study by Araujo et al. (2020) showing 79% of higher-education music students exceeded recommendations, 10% met recommendations, and 11% did not. Study 3 is however, the first study of its kind in investigating PA/PE in **professional** musicians and contrary to research suggesting that musicians' engagement in exercise is limited (Kreutz et al., 2008, 2009; Panebianco-Warrens et al., 2015; Araujo et al., 2017) showed most exceeded recommended exercise levels and thus health promoting behaviours such as PA/PE.

Study 3 showed that the number of days professional musicians spent walking during the pandemic was significantly higher than the days spent walking pre-COVID-19, but that the mean for days spent engaging in vigorous PA/PE was significantly higher pre-pandemic. This may be due to restrictions of using gyms or engaging with sports teams during the pandemic as opposed to solitary walking which would be allowed during various lockdowns. The possibility of recall bias over the two-year period also needs to be considered. Results also showed that as opposed to postgraduate students, orchestral musicians and freelancers were the group of musicians who increased the most in levels of PA/PE from pre- to during COVID-19. Orchestral musicians increased the most for vigorous PA/PE from pre- to during COVID-19, while freelancers increased the most for moderate PA/PE. This is in line with research by Dinardi et al. (2023) who found that during the pandemic performing artists engaged in PA/PE as a coping strategy.

Results also showed orchestral musicians as the largest group of musicians engaging in PA/PE, a result which might be explained through the prevalence of PRMDs in the sector (Middlestadt & Fishbein, 1988; Blum, 1995; Steinmetz et al., 2015a, 2015b). Following this, the number of days orchestral musicians spent in moderate PA/PE during COVID-19 was found to be significantly higher than that spent by postgraduate students. Finally, although IPAQ results in Study 3 showed walking (low intensity exercise) to be the most frequent activity pre- and during COVID-19, 54% of professional musicians reported engaging in moderate exercise, such as jogging. This might show that participants do not distinguish between the different intensities. Kapteyn et al. (2018) state that participants may not distinguish between moderate and vigorous PA/PE and that they may count the same activities twice as they believe both can constitute moderate and vigorous intensities.

The majority of professional musicians reported engaging in daily/weekly PA/PE whenever they could slot it in, rather than as a priority re performance. Most musicians, in fact, reported engaging in PA/PE to maintain and/or improve general physical health, with 60% stating that they engaged in PA/PE without a view of it enhancing performance. Study 3 also showed that participants' engagement with PA/PE depended on how anxiety-inducing a performance was perceived as being. Other musicians in the study reported always/almost always engaging in PA/PE prior to orchestral performance, with this happening only sometimes for chamber/duo performances, rarely for auditions and never prior to solo performances. Among the reasons participants gave for rarely/never engaging in PA/PE were to prevent distraction and overexertion prior to these scenarios.

Dependent on how anxiety-inducing a scenario was perceived as being was also the choice of PA/PE on the day of performance. The generally preferred endurance exercises, for example, changed to flexibility exercises, such as yoga, to increase flexibility prior to audition and chamber/duo performances. For trial orchestral and solo performances musicians reported a blend of flexibility and endurance exercises which included yoga and running. On the day of orchestral performance, professional musicians resorted to endurance exercise (running).

Study 3 showed that participants choosing to deliberately engage in PA/PE prior to performance reported that they perceived PA/PE as having had a positive impact on chamber/duo, solo and orchestral performances, but not on audition. Although participants engaging in PA/PE with a view of enhancing performance would be naturally inclined to perceive an effect of PA/PE on performance, results showed that the perceived effects of PA/PE differed depending on performance scenario. On the day of chamber/duo, orchestral trial performances, audition and solo performances, for example, most participants reported that they perceived PA/PE as helping them with releasing stress, while on the day of orchestral performance PA/PE was perceived as having helped with stamina.

While participants reporting no effect of PA/PE on audition/orchestral trial performances provided no reasons for their answers, it is worth noting that such reports might have been dependent on performance outcome. This especially considering that PA/PE was reported as having been perceived as not having had an effect on performance for scenarios which required a formal validation of performance, unlike chamber/duo and solo performances both of which were reported as having been impacted by PA/PE. It might also be the case that musicians found it easier to report on the effects of PA/PE when expectations concerned the physical aspect of performance such as increased stamina, than when reporting on the psychological impact of PA/PE on performance, such as in coping with performance anxiety.

Study 3, conducted after the third and last UK lockdown showed that 73% of professional musicians were classified as depressed, in line with research by Spiro et al. (2021) carried out during the first UK lockdown showing that 69% of performing artists were classified as depressed, thus substantially higher than the 26% of the general population reported in a study carried out by the end of March 2020 (Fancourt et al., 2021). This provides corroboration for the study reported here. However, this study also showed 61% of professional musicians reported moderate levels of wellbeing, but as many as 39% as lonely, while the average score for social connectedness was of 62.3 (*SD* 14.4). This compared to 9% of the population which classified as lonely in 2019/20 (Gov.uk, 2021) and the average score for social connectedness of 41.48 (*SD* = 15.49) in 2018/19 (Tymoszuk et al., 2021).

Contrary to what was expected, Study 3 showed no association between PA/PE and wellbeing as in a study carried out on the general population during COVID-19 (Wood et al., 2010) and on performing arts professionals during the pandemic (Spiro et al., 2021). The explanation may lie in the fact that as Vaag et al. (2016) state, the psychological distress in professional musicians is higher than that in the general population. However, it could also be the case that since by the third lockdown musicians were still living through cancelled contracts and financial hardships, PA/PE might not have been enough to support their wellbeing given such adversity.

In this study, age correlated with depression, with younger professional musicians scoring higher in depression than older ones. Although this association is very well documented in the literature and varies explanations exist as to the reasons why including higher stress and lower coping resilience in young people, the association found in Study 3 might in part be due to the uncertain prospect of a future career more than a year into the pandemic for those just starting off. Another surprising result of this study is that no significant difference was found between gender and depression. An interesting finding, however, was the negative association found between depression and years spent playing in orchestra, suggesting that the longer one works in an orchestral setting the less likely one is to be depressed. These also had higher wellbeing scores. An unexpected finding from Study 3 was in relation to instrument type and social connectedness with brass and percussionists scoring higher than the rest of instrumentalists, suggesting that there is scope for research to explore the interplay between temperament, instrument choice and music specialization.

The importance of Study 3 lies in having shown the importance that PA/PE has in professional musicians' lives and musical performance: 83% of professional musicians either exceeded or met the recommended weekly requirements for PA/PE, 74% engaged in PA/PE as part of their daily/weekly lives, 40% engaged in PA/PE with a view of enhancing performance. However, the study also showed that 78% had no training on PA/PE and performance, 71% considered learning about PA/PE and performance to be extremely important, and 81% were interested in learning how PA/PE could be used as a pre-performance routine. These findings, together with the fact that physical exercise has been largely documented to have positive effects on health and wellbeing, make a compelling argument for future research to further investigate the effects of PA/PE on performance due to fitness factors. Further research into how PA/PE can be implemented in one's musical education to enhance performance becomes especially relevant when one considers the suggestion made by Araujo et al. (2020) about the importance of investigating whether musicians' physical fitness is sufficient to meet the demands of the physical exertion required for rehearsals and performances. and indicate how PA/PE can be implemented in one's musical education to enhance performance.

CHAPTER 7

Discussion and Conclusion

7.1 INTRODUCTION

This thesis investigated professional musicians' pre-performance routines and strategies in preparing to perform through three related mixed-method studies. Section 7.2 gives an outline of the findings for each of the research questions. Section 7.3 discusses the strengths of the programme of research while section 7.4 discusses its limitations. Section 7.5 suggests potential applications of the findings for training and practice, section 7.6 discusses directions for further research, and 7.7 is the conclusion.

7.2 OUTLINE OF FINDINGS

The aim of the present thesis is summarized in the following question:

How do professional musicians prepare in order to optimize performance?

This section focuses on how each of the research questions within this overarching question has been answered.

RQ1: What, if any, pre-performance routines do professional musicians engage in prior to performance and does this change during the pre-performance period?

RQ1 and RQ2 were answered through data collection and analysis of the *Pre-performance Routines* survey. In answer to RQ1 it was found that professional musicians engaged in 5 factors denoting separate categories of behaviours: Physical Readiness (deep breathing/relaxation exercises (including stretching), meditation, and exercise), Technical Preparation (going over notes/chords/passages that have been well-prepared, and going over notes/passages that have not been well-prepared), Substance-intake (smoking cigarettes and taking sedatives), Distraction Methods (thinking about other things to keep the mind off performance, reading something distracting, drinking alcohol, and going out or meeting with friends) and Talking to Other Musicians (talking to one's mentor, talking to one's co-performer). With the exception of Substance-intake, most professional orchestral musicians engaged equally highly with the sub-scales within each category of behaviour. No significant difference was found between gender and the total scores in the five factor categories.

In the main, the behaviours engaged in by professional orchestral musicians either increased or did not change up to the performance. More specifically, seven behaviours were reported as not changing, six as increasing, and only one as decreasing (this was drinking alcohol). With regards to behaviours reported as **not changing** prior to performance (in order of importance), these included Distraction Methods (specifically reading something distracting / thinking about other things to keep the mind off performance / going out with friends), Physical Readiness (exercise), Talking to Other Musicians (talking to co-performers / talking to one's teacher/mentor about performance), and Substance Intake (smoking cigarettes).

With regards to behaviours reported as **increasing** prior to performance these were (in order of importance): Technical Preparation (going over notes/chords/passages/scores which have been well-prepared / going over notes/chords/passages/scores which have not been well-prepared); Physical Readiness (deep breathing and relaxation exercises (including stretching) / meditation; being alone, and Substance-Intake (taking sedatives). The only behavaiour reported as mostly **decreasing** during the pre-performance period was drinking alcohol (Distraction Methods), which might be an unreliable result considering what is considered a socially desirable response.

RQ2: What are the reasons behind musicians' engagement and change in pre-performance routines?

With the exception of physical exercise, participants did not provide reasons for not changing their behaviours prior to performance. Although few responded, reasons given were related to an enhanced sense of calm and to the release of excess energy through exercise. With as regards to reasons for changing (increasing or decreasing) behaviours participants reported doing so with the intent of enhancing focus prior to performance. To achieve this goal, however, professional musicians engaged in contrasting behaviours. To help cope with performance anxiety, for example, some reported increasing going over notes/chords/passages/scores that were not well-prepared, while others decreased this behaviour in favour of going over well-prepared passages. One pre-dominant finding of this research, therefore, is that the perceived functions pre-performance fulfil are different across professional musicians.

In answering RQ1 and RQ2 it was also found that 77% of professional orchestral musicians engaged in exercise in their daily/weekly routines. This is in contrast with some of the literature suggesting that musicians' engagement with exercise is limited (Kreutz et al., 2008, 2009; Panebianco-Warrens et al., 2015; Araujo et al., 2017) but is in line with more recent research on music students in higher education who meet general physical recommendations for exercise (Matei & Ginsborg, 2020; Araujo et al., 2020). This important finding therefore suggests that as physical exercise was part of most professional musicians' daily/weekly routine, and it was reported as not changing prior to performance, a better understanding of the pre-performance routines of professional musicians is needed. This therefore led to RQ3.

RQ3: How do professional musicians perceive their pre-performance routines to have an effect on performance? Is this reflected in their recollections of optimal performances as compared with their worst?

RQ3 was answered through data collection and analysis of twelve semi-structured interviews with professional orchestral musicians. The results were divided across Chapters 4 and 5. To find out the perceived effect of pre-performance routines on performance, Chapter 4 concerned itself with results relating to performance strategies adopted by professional orchestral musicians on the day of performance. To find out if the perceived effects of pre-performance routines on performance were reflected in their recollection of such performances, Chapter 5 focused on performance strategies adopted on the days of optimal and worst performance.

Results showed that during the pre-performance period, and as per findings in Study 1, participants indicated going over technical work and repertoire they knew well. Professional orchestral musicians also reported exercising, sometimes even between dress rehearsals and performances showing that as per the finding in Study 1, participants did not alter their exercise during the pre-performance period. Their perception of the effect of this pre-performance routine on performance included an increase in one's alertness, in feeling grounded and in helping towards slowing down breathing when anxious. The type of physical exercise engaged in was primarily endurance/cardio training with one participant reporting on flexibility exercises. Professional orchestral musicians also reported increasing time alone during the pre-performance period. This was so they could read, engage in breathing exercises or play their instrument. The perception of the effect of being alone on performance was to get into the zone, ground oneself, reword negative thoughts to positive ones, calm oneself down and retain contact with the instrument. Another pre-performance routine was socializing with colleagues as this was perceived to help create a sense of shared purpose, energize oneself and others, and normalize performance. Participants also reported warming up on one's instrument to be mentally, emotionally and physically ready for performance.

Findings in Chapter 4 also showed that going over general technical work or passages from the upcoming performances, and engaging in physical exercise on the day of performance till the onset of the pre-performance period were two of the three performance strategies professional orchestral musicians employed. Participants reported engaging in a blend of endurance/cardio exercise and strength training 5 or more times a week for a total of 60 minutes or more, thus going over and above the recommended 150 minutes of moderate-intensity aerobic physical activity/physical exercise per week (or 75 minutes of vigorous-intensity physical activity/physical exercise) and muscle-strengthening activities two or more days weekly (World Health Organization [WHO], 2010).

Orchestral musicians gave various reasons for their daily/weekly engagement in exercise. These included reasons related to medical conditions while others related to the offsetting of future ailments in order to sustain a career in performing. Participants also reported exercising to maintain good general physical and mental health, to promote positive wellbeing, and to cope with general stress and anxiety. Findings showed that musicians exercised with a view of improving playing posture and as a means of enhancing focus and productivity, therefore helping to sustain the demands of the job. Professional musicians also reported exercising as a strategy towards coping with debilitative performance anxiety for the calming effect post-exercise. Through exercise participants reported being able to cope with the physical demands of performing. This was especially the case for pit musicians who highlighted the importance of building stamina to sustain the frequency of playing long rehearsals and performances. Some musicians also reported needing to be physically fit to perform. However, this belief was shared more by players of large instruments, such as cellists and double bassists, than by players of smaller instruments, such as violinists and violists.

The findings in Chapter 5 showed that professional orchestral musicians' recollections of their optimal and worst performance did not entirely reflect the perceived effects of their pre-performance routines. While some participants recollected engaging in pre-performance routines such as warming up, exercising, rewording negative thoughts to positive ones, and following one's pre-performance routine prior to experiencing optimal performance, others recollected engaging in such pre-performance routines yet still went on to experience suboptimal performances. Similarly, some musicians recollected experiencing optimal performance despite not having engaged in their usual pre-performance routines.

Perhaps surprisingly, results showed that good preparation was not always indicative of performance outcome as some musicians reported their worst performance despite having been well prepared for performance. What emerged, however, was that most sub-optimal performances occurred while orchestral musicians were on tour, during long, repeat performances where musicians felt physically and mentally fatigued. Other sub-optimal performances occurred in a period of time when orchestral musicians' social connections with colleagues were poor.

Moreover, the performance strategies and pre-performance routines most musicians reported as engaging in to help reproduce optimal performance or cope with a substandard one, seemed to lack depth and consistency. This confirms literature which indicates that musicians might have heard of strategies for performance but not learnt how to use them, or might have learnt them ineffectively, or might not have truly understood their applicability or utility (Hays, 2002). Others reported that they had no control over their performances and that therefore they had no performance strategies and pre-performance routines to help reproduce optimal performance and help cope with substandard ones.

The results to RQ3 corroborated some findings from Study 1 and shed further light on the pre-performance routines engaged in and the reasons behind such engagement. Findings also highlighted the role played by exercise in professional orchestral musicians' daily/weekly routine and its perceived effect on performance. This led to RQ4, RQ5, and RQ6.

RQ4: What are professional musicians' perceptions of their levels of physical fitness?

RQ4, RQ5, and RQ6 were answered through data collection and analysis of the *Fit Musician* survey. Results for RQ4 showed that pre-COVID-19, 52% of professional musicians exceeded the recommended weekly limits of 500-1000 MET-minutes spent in PA/PE (Office of Disease Prevention and Health Promotion, 2008), 31% met recommendations and only 18% did not. During COVID-19 results showed an overall increase in PA/PE resulting in 56% of participants exceeding the recommended weekly limits, 36% meeting general recommendations, with only 8% who did not. For comparison, a study by Matei and Ginsborg (2020) showing that 26% of conservatoire students exceeded recommended weekly limits, 70% met recommendations and 4% did not, and a study by Araujo et al. (2020) showing 79% of higher-education music students exceeded recommendations, 10% met recommendations, and 11% did not.

As opposed to freelancers and postgraduate students, orchestral musicians were shown to be the largest group of musicians engaging in PA/PE, a result which might be explained through the prevalence of PRMDs in the sector (Middlestadt & Fishbein, 1988; Blum, 1995; Steinmetz et al., 2015a, 2015b). Following this, the number of days orchestral musicians spent in moderate PA/PE during COVID-19 was found to be significantly higher than that spent by postgraduate students. Finally, although IPAQ results in Study 3 showed walking (low intensity exercise) to be the most frequent activity pre- and during COVID-19, 54% of professional musicians reported engaging in moderate exercise, such as jogging.

RQ5: What physical activity and exercise do professional musicians engage in, and what are the reasons for this?

The majority of professional musicians (74%) reported engaging in PA/PE to maintain and/or improve general physical health, with 40% stating that they engaged in PA/PE with a view of enhancing performance. Of the 40% engaging in PA/PE to enhance performance, most did so with a view of enhancing their orchestral performances. The reasons given were to improve concentration levels, keep physically fit, and help clear the mind. Results showed that endurance exercise was the preferred type of PA/PE by most of the participants, followed by flexibility, strength, and balance. The preferred level of intensity at which participants engaged in PA/PE was moderate exercise, followed by vigorous and then light exercise. Running was the most popular type of endurance training, while yoga was the type of exercise which ranked the highest for flexibility and balance. Weightlifting was the exercise of choice for strength training.

Participants' engagement with PA/PE also depended on how anxiety-inducing a performance was perceived as being. Most musicians reported always/almost always engaging in PA/PE prior to orchestral performance, with this happening only sometimes for chamber/duo performances, rarely for auditions and never prior to solo performances. Among the reasons participants gave for rarely/never engaging in PA/PE were to prevent distraction and overexertion prior to these scenarios. The type of PA/PE engaged in was also dependent on how anxiety-inducing a scenario was perceived as being. The generally preferred endurance exercise, for example, changed to flexibility exercises, such as yoga, to increase flexibility prior to audition and chamber/duo performances. For trial orchestral and solo performances musicians reported a blend of flexibility and endurance exercises which included yoga and running. On the day of orchestral performance, professional musicians resorted to endurance exercise (running).

RQ6: What are the perceived functions of physical activity and exercise for wellbeing and on performance?

Conducted during the third and last UK lockdown, results showed that 73% of professional musicians were classified as depressed. This is in line with research by Spiro et al. (2021) carried out during the first UK lockdown showing that 69% of performing artists were classified as depressed, thus substantially higher than the 26% of the general population reported in a study carried out by the end of March 2020 (Fancourt et al., 2021). However, results also showed that 61% of professional musicians reported moderate levels of wellbeing, but as many as 39% reported feeling lonely, while the average score for social connectedness was of 62.3 (*SD* 14.4).

Contrary to what was expected, results for RQ6 showed no association between PA/PE and wellbeing as in the study carried out on the general population during COVID-19 (Wood et al., 2010) and on performing arts professionals during the pandemic (Spiro et al., 2021). This could be due to the higher levels of psychological distress in professional musicians as opposed to the general population (Vaag et al., 2016) or to the fact that musicians were still living through cancelled contracts and financial hardships and PA/PE might not have been enough to support their wellbeing during such adversity.

With regards to physical exercise and performance, no associations were found between IPAQ-SF (pre- and during COVID-19) and perceived impact on performance. Nonetheless, considering that this study showed that as many as 83% (116/140) of professional musicians either exceeded or met the recommended weekly requirements for PA/PE, and that 74% (73/98) engaged in PA/PE as part of their daily/weekly routine, it is evident that PA/PE is a large part of most musicians' daily/weekly routine. There may also have been too little variation in this study to indicate a relationship to performance. Findings also pointed to an overwhelming large proportion of musicians (78%) reporting that they have had/have no training on PA/PE and performance, to three quarters of participants who consider that learning about PA/PE and performance is extremely important to their career, and to 81% stating that they would be interested in learning how to use PA/PE as part of a pre-performance routine. These findings indicate that it is worth investing in future research which investigates the effects of PA/PE on performance taking into account more parameters of context, experience and musical demands in order to better advise musicians on the best PA/PE as tailored to their needs.

7.3 STRENGTHS OF THE PROGRAMME OF RESEARCH

One of the strengths of this research is that it is the first of its kind to investigate pre-performance routines in professional musicians. This is also the first research to investigate pre-performance routines in the music domain. This research introduces the term "pre-performance period", defining it as the period of time in which one engages in task-relevant thoughts and actions leading to a musical performance, and finds that this period of time varies across participants, is dependent on how anxiety-inducing a performance scenario is perceived as being, and is not likely to be a function of exposure to a performance setting. This research therefore highlights the probable adverse effects that long pre-performance periods might have on the physical and mental health of professional musicians as this might overlap with the short downtime during busy schedules. One of the strengths of this research is that in uncovering the pre-performance routines adopted by successful musicians' results can be used to inform other musicians and music students to adopt, adapt and perhaps change existing pre-performance routines to enhance performance.

This research is also the first to investigate PA/PE in professional musicians. It is the first to investigate professional musicians' perceptions of PA/PE and to also do so during COVID-

19. It is also the first to investigate professional musicians' perceived impact of PA/PE for wellbeing and performance. The strength of this research also lies in its results showing that contrary to literature suggesting that musicians' engagement in exercise is limited (Kreutz et al., 2008, 2009; Panebianco-Warrens et al., 2015; Araujo et al., 2017) professional musicians exceeded the recommended weekly limits spent in PA/PE. It also showed that 40% of professional musicians engaged in PA/PE with a view of enhancing performance. This, together with findings showing that most musicians consider learning about PA/PE and performance as extremely important to their career, and that most professional musicians are interested in learning how to use PA/PE as part of a pre-performance routine, strengthens the importance of this research in laying the groundwork for future research wanting to investigate on the effects of PA/PE on performance.

7.4 LIMITATIONS OF THE PROGRAMME OF RESEARCH

All studies have limitations, and those in this thesis need to be addressed to fully understand the findings. Although Study 1 is the only research of its kind in investigating the pre-performance routines in professional musicians, sample size was small. Added to this were some measurement limitations. Although participants were given the option of including other behaviours engaged in prior to performance, the 15-item list of behaviours did not include other cognitive and performance-related items such as motivational self-talk, visualization, imagery, and mindfulness which, if added to the original MPPS (Steptoe et al., 1995) consisting of mostly behavioural items, might have provided a clearer picture of the pre-performance routines engaged in prior to performance. There is also some inconsistency in the original MPPS in that the list of behaviours in the questionnaire also include thoughts. The original MPPS scale employed a 4-point scale to determine which pre-performance routines participants increased prior to performance. To avoid the bias implied in asking participants to rate the increase in routines by selecting one of either "often", "sometimes", "rarely" and "never", participants in Study 1 were asked to rate each of the pre-performance routines according to whether they decreased, increased, made no change to, or found the routine to be "not applicable" to them. However, other adapted Likert-type scales may have served the purposes of Study 1 better.

The limitations in Study 2 revolved around the inability to conduct in-person interviews due to the restrictions imposed by the COVID-19 pandemic. Although it was possible for interviews to be conducted online through platforms such as Skype, Zoom and Facebook

Messenger, connectivity issues, background distractions, as well as possibly missed verbal-cues, may have limited the connection with the participants and the extent of their response.

With as regards to Study 3, the study had a relatively modest sample size which might have contributed to some non-significant results and Type 1 errors (Williamon et al., 2021). It was also a cross-sectional study and therefore did not allow for objective investigation over time. It did not have a control group to compare results with other non-musician groups. Study 3 was conducted during the pandemic which might also have distorted professional musicians' views, attitudes and emotions. Recall bias might have also affected the estimation of PA/PE pre-COVID-19. There is also the general issue with reporting bias in self-report surveys. With as regards to the use of IPAQ, as Hagstromer et al. (2010) state, the measure may be susceptible to bias and over-rating. However, considering the social restrictions imposed by the pandemic, this was the only means through which physical fitness, physical activity and exercise in professional musicians could be investigated. Finally, online fatigue also documented by Gregersen et al. (2023) might have contributed to response fatigue and therefore might have lowered the reliability of answers towards the end of the study. It was likely also responsible for a number not completing the survey.

Most of these limitations are common to both qualitative and quantitative investigation and do not nullify the results. This thesis investigated professional musicians and their pre-performance routines and found that PA/PE was part of their daily/weekly routine for nearly all (83% exceeding or meeting recommended weekly requirements) with most of these (74%) having daily/weekly engagement and 40% engaging in PA/PE with a view of enhancing performance. This is heartening in providing the groundwork for future research investigating PA/PE and performance involving randomized case/control study in which musicians are required to perform twice, once under normal conditions as control, and once after having completed acute exercise prior to a recovery phase. Both performances could then be recorded and passed on to an expert panel of musicians determining best performance. This intervention would be preceded by baseline controls for physical fitness, depression, wellbeing and state anxiety.

7.5 POTENTIAL APPLICATIONS FOR TRAINING AND PRACTICE

In providing a picture of how professionals prepare to perform, this thesis provided insight into how successful musicians - the ones that have been preparing for performance the longest - prepare to perform, unveiling performance strategies and pre-performance routines that can be used to inform how music students can adopt, adapt and change their practice routines to perform optimal performances. This thesis, therefore, makes a contribution to practice and points at future directions in terms of training for musicians' in preparing to perform, practicing performance, and in enhancing physical fitness for performance. So how can these directions be implemented in practice and education?

The current situation in music conservatoires across the world requires students to audition for a place in the chosen conservatoire, and once successful, students are registered and fully immersed in the programme of their choice. This means that at no point do conservatoires consider a holistic approach towards their individual students, who typically know little about them apart from how capable they have been in giving a successful performance in an audition setting. Students are therefore catapulted into intense training programs without prior assessments on general health and wellbeing, areas which require considerable consideration especially in a post-pandemic world whereas shown in this thesis, the rate of depression in younger musicians is very high, the presence of PRMDs considerable, and the need to be fit to perform is paramount. Such assessment would help in determining areas that require attention and which would therefore help students thrive both in general health and wellbeing but also in their performance. This thesis therefore suggests the introduction of a monitoring process that assesses areas of general health and wellbeing. However, because the main focus of this thesis is physical fitness, physical activity and exercise, the following suggestion concerns screening for physical fitness in music students.

Such a monitoring could provide (i) functional physiotherapy assessment, (ii) range of motion/flexibility measurements, (iii) muscular strength and endurance measurements, (iv) aerobic capacity (Trinity Laban Conservatoire of Music and Dance, 2023). In the functional physiotherapy assessment physiotherapists would investigate a history of PRMDs and other injuries, and evaluate potential risk for injury. Measurements in range of motion/flexibility would help in uncovering any weaknesses, tightness and restrictions in range of motion which could impact performance, while muscular strength and endurance measurements would identify muscular imbalances which might increase the potential for injury. Tests in muscle endurance would also help music students identify their limits in terms of the long hours dedicated to practice and performance and work towards enhancing endurance sustainably. Finally, measurements in aerobic capacity would measure aerobic fitness and provide information on one’s ability to delay the onset of fatigue.

Individual feedback would be provided at the end of the screening process, discussing results in the context of the student’s practice and performance schedule, with recommendations for optimizing training and performance. Upon request from the student, results and feedback could be shared with one’s instrumental tutors so that special attention is given in choosing repertoire which does not exacerbate students’ physical weaknesses and which ties in with the recommended training programme in ensuring a progressive loading towards being fit to perform. It is recommended here that such monitoring is not only carried out at the onset of one’s studies at a conservatoire but that they continue to be carried out periodically accompanying music students through the course of their studies to ensure better health and wellbeing enhancing performance optimization. It may also be possible to incorporate methods of self-monitoring as individuals progress in their music careers.

If extended to orchestral bodies such monitoring procedures could ensure that each orchestral musician is provided with the best care to sustain their career longevity and wellbeing. Clearly ethical issues around privacy, confidentiality and lack of discrimination re disability would have to be put in place and advocated by regulatory bodies. Although this proposal is new, there is a precedent with steps towards health and wellbeing have been taken by one orchestra in particular. As presented in a thematic session in the latest International Symposium on Performance Science held in Warsaw in August 2023, the Royal Liverpool Philharmonic Orchestra has implemented a programme to support musicians’ development and enhancement of the technical, artistic, physical and psychological attributes required for optimal performance (Araujo & Garden, 2023). This programme includes free physiotherapy and massage therapy for its musicians, initiatives on musicians’ physical health, and a performance coach, all elements which this thesis suggests conservatoires provide for their students. Such a programme addresses, in part, the issue brought to light in this thesis which concerns the lack of knowledge that current professionals have with as regards to the mental and physical strategies helping them to reproduce optimal performances and cope with substandard ones. Through similar initiatives, it is proposed here that a programme specifically geared towards equipping orchestral musicians with pre-performance routines and performance strategies to enhance performance, enhancing orchestral musicians’ sense of control over their performances, thus positively impacting their wellbeing.

Such a programme could also be extended to conservatoires. In this setting, conservatoires could invest in the provision of a new module revolving around pre-performance routines in which students are presented with the pre-performance routines adopted by professional musicians as insight into pre-performance routines they could emulate and adopt prior to their own performances. Such a module would include strategies for performance optimisation which include physical and psychological skills to enhance performance. To render this as relevant as possible to performers this module could be presented into a series of workshops where students learn the application of these skills to their performance.

Besides the introduction of this module, conservatoires could also hold general talks and discussions lead by a panel of experts and professional musicians relating to pre-performance routines and the role physical activity and exercise play in being fit to perform. In addition, conservatoires could also include a free gym membership for all students. Such memberships could include gyms in the vicinity, or better still, unused spaces in the conservatoires could be refurbished and converted into a gym. To guide students towards the use of equipment and to help them follow the recommended individual programs created during the screening process, a team of physiotherapists and gym instructors could be present at pre-determined days and times.

7.6 DIRECTIONS FOR FUTURE RESEARCH

This thesis investigated the preparation that professional musicians engage in to optimize performance. Future research could, therefore, explore the next phase of performance, which is post-performance routines. More specifically, there is scope for research to investigate how professional musicians review their performance and how they respond to such review, for example recovering from a negative performance. Research could then move to a more comprehensive picture of self-regulation, both physical and mental, in professional musicians. Such research could investigate the post-performance period with a similar categorization of routines as linked to mental and social wellbeing, as well as modifications of their pre-performance routines. This would need to be accompanied by an exploration of the reasons behind the routines engaged in during the post-performance period and the implications these have for their review of performance and moving forward to further performances. This could also examine the amount of insight these performers have, perhaps with some outside marker for how well the musicians performed.

7.7 CONCLUSION

This thesis has answered the overarching question of:

How do professional musicians prepare in order to optimize performance?

It has done so through investigating pre-performance routines in professional musicians, and through exploring whether these change during the pre-performance period. It investigated musicians' reasons for engaging with these routines and the functions these were perceived as having. As results showed that (i) the majority of performers engaged in physical activity and exercise in their daily/weekly routine, and that (ii) half of participants reported no change in this behaviour prior to performance - with some participants exercising prior to performance with a view of enhancing performance - this thesis investigated professional musicians' perceived level of physical fitness, the type of physical activity and exercise engaged in, as well as the reasons behind this engagement. It also explored the function that physical activity and exercise was perceived as having on performers' wellbeing and performance.

To address the urgency of bridging the gap between research and practice, various suggestions have been made. These include the introduction of (i) a monitoring process for health and wellbeing in musicians, (ii) proposed programs for orchestral bodies and course modules for conservatoires, addressing pre-performance routines and physical and mental strategies including physical activity and exercise, (iii) gym subscriptions, (iv) the proposed refurbishment of unused conservatoire spaces into gyms, and (iv) the setting-up of a team of physiotherapists and gym instructors to help students follow the recommendations given during the monitoring process towards becoming fit to perform. As Araujo (2023) states, despite the wealth of knowledge on topics such as musicians' health and wellbeing, and practices to sustain health careers, significant gaps still exist between knowledge and evidence, and what happens in practice during training and performance. In the present climate where musicians face old and new challenges, and the reverberations of the recent COVID-19 pandemic have not all ceased, and economic and mental challenges abound in the modern world, this thesis contributes to the ever-increasing demand for action, responding as best it can to help towards musicians' enhanced health and wellbeing and performance optimisation.

REFERENCES

Abel, J. L., & Larkin, K. T. (1990). Anticipation of performance among musicians: Physiological arousal, confidence, and state-anxiety. *Psychology of Music*, *18*(2), 171-182.

Abel, J. L., & Larkin, K. T. (1991). Assessment of cardiovascular reactivity across laboratory and natural settings. *Journal of Psychosomatic Research*, *35*(2-3), 365-373.

Ackerman, B. J., & Adams, R. D. (2004). Perceptions of causes of performance-related injuries by music health experts and injured violinists. *Perceptual and Motor Skills*, *99*(2), 669-678.

Ackermann, B., Adams, R., & Marshall, E. (2002). Strength or endurance training for undergraduate music majors at a university? *Medical Problems of Performing Artists*, *17*(1), 33-41.

Ackermann, B. J., Kenny, D. T., O'Brien, I., & Driscoll, T. R. (2014). Sound Practice—improving occupational health and safety for professional orchestral musicians in Australia. *Frontiers in Psychology*, *5*, 973.

Albert, P. R. (2015). Why is depression more prevalent in women? *Journal of Psychiatry and Neuroscience*, *40*(4), 219-221.

Alpert, R., & Haber, R. N. (1960). Anxiety in academic achievement situations. *The Journal of Abnormal and Social Psychology*, *61*(2), 207.

Angane, E. Y., & Navare, A. A. (2017). Effects of aerobic exercise on pulmonary function tests in healthy adults. *International Journal of Research in Medical Sciences*, *4*(6), 2059-63.

Araújo, L. (2023, August 17-20). Bridging the gap between what we know and what we do: Pragmatism and applied approaches in performance science [Paper presentation]. International Symposium on Performance Science, Warsaw, Poland.

Araújo, L. S., Wasley, D., Perkins, R., Atkins, L., Redding, E., Ginsborg, J., & Williamon, A. (2017). Fit to perform: an investigation of higher education music students' perceptions, attitudes, and behaviours toward health. *Frontiers in Psychology, 8*, 285375.

Araújo, L. S., Wasley, D., Redding, E., Atkins, L., Perkins, R., Ginsborg, J., & Williamon, A. (2020). Fit to perform: a profile of higher education music students' physical fitness. *Frontiers in Psychology*, *11*, 486536.

Arora, S., Sevdalis, N., Nestel, D., Woloshynowych, M., Darzi, A., & Kneebone, R. (2010). The impact of stress on surgical performance: a systematic review of the literature. *Surgery*, *147*(3), 318-330.

Ascenso, S., Williamon, A., & Perkins, R. (2017). Understanding the wellbeing of professional musicians through the lens of Positive Psychology. *Psychology of Music*, *45*(1), 65-81.

Atkinson, J. W., & Feather, N. T. (1966). A theory of achievement motivation. *(No Title)*.

Babbie, E. (1990). *Survey Research Methods*. Wadsworth Pub.

Bahrke, M. S., & Morgan, W. P. (1978). Anxiety reduction following exercise and meditation. *Cognitive Therapy and Research*, *2*, 323-333.

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioural change. *Psychological Review*, *84*(2), 191.

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist*, *37*(2), 122.

Bartholomew, J. B. (2000). Stress reactivity after maximal exercise: the effect of manipulated performance feedback in endurance athletes. *Journal of Sports Sciences*, *18*(11), 893-899.

Bartholomew, J. B., Morrison, D., & Ciccolo, J. T. (2005). Effects of acute exercise on mood and well-being in patients with major depressive disorder. *Medicine & Science in Sports & Exercise*, *37*(12), 2032-2037.

Bauman, A., Ainsworth, B. E., Bull, F., Craig, C. L., Hagströmer, M., Sallis, J. F., ... & Sjöström, M. (2009). Progress and pitfalls in the use of the International Physical Activity Questionnaire (IPAQ) for adult physical activity surveillance. *Journal of Physical Activity and Health*, *6*(s1), S5-S8.

Beilock, S. L., & Carr, T. H. (2001). On the fragility of skilled performance: What governs choking under pressure? *Journal of Experimental Psychology: General*, *130*(4), 701.

Beilock, S. L., Carr, T. H., McMahn, C., & Starks, J. L. (2002). When paying attention becomes counterproductive: Impact of divided versus skill focused attention on novice and experienced performers of sensorimotor skills. *Journal of Experimental Psychology: Applied*, *8,* 6-16.

Bejjani, F. J., Kaye, G. M., & Benham, M. (1996). Musculoskeletal and neuromuscular conditions of instrumental musicians. *Archives of Physical Medicine and Rehabilitation*, *77*(4), 406-413.

Benight, C. C. (1989, August). A theoretical model for exercise as a mediator of anxiety. [Paper presentation]. Annual Meeting of the American Psychological Association, New Orleans, LA, United States.

Berque, P., Gray, H., & McFadyen, A. (2016). Playing-related musculoskeletal problems among professional orchestra musicians in Scotland. *Medical Problems of Performing Artists*, *31*, 78-86.

Biasutti, M. (2011). Flow and optimal experience. In *Encyclopedia of creativity, Second Edition*, (Vol. 1, pp. 522-528). Academic Press.

Biasutti, M. (2017). Teaching improvisation through processes. Applications in music education and implications for general education. *Frontiers in Psychology*, *8*, 247610.

Biasutti, M., & Concina, E. (2014). The role of coping strategy and experience in predicting music performance anxiety, *Musicae Scientiae*, *18*(2), 189-202.

Bibeau, W. S., Moore, J. B., Mitchell, N. G., Vargas-Tonsing, T., & Bartholomew, J. B. (2010). Effects of acute resistance training of different intensities and rest periods on anxiety and affect. *The Journal of Strength & Conditioning Research*, *24*(8), 2184-2191.

Biddle, S. J., & Fox, K. R. (2003). The way forward for physical activity and the promotion of psychological well-being. In S.J.H. Biddle & S.H. Boutcher (Eds.), *Physical activity and Psychological Well-being* (pp.166-173). London: Routledge.

Biddle, S.J., Fox, K.R., & Boutcher, S.H. (Eds.). (2000). *Physical Activity and Psychological Well-Being*. London: Routledge.

Biggs, J. (1988). Approaches to learning and to essay writing. In *Learning Strategies and Learning Styles* (pp. 185-228). Boston, MA: Springer US.

Biggs, J. B. (1984). Learning strategies, student motivation patterns, and subjectively perceived success. *Cognitive Strategies and Educational Performance*, 111-134.

Billman, G. E. (2011). Heart rate variability–a historical perspective. *Frontiers in Physiology*, *2*, 86.

Blair, S. N., Haskell, W. L., Ho, P., Paffenbarger JR, R. S., Vranizan, K. M., Farquhar, J. W., & Wood, P. D. (1985). Assessment of habitual physical activity by a seven-day recall in a community survey and controlled experiments. *American Journal of Epidemiology*, *122*(5), 794-804.

Blum, J. (1995). Das Orchester als Ort korperlicher und seelischer Harmonie? Eine Erhebung unter bundesdeutschen Streichern. *Das Orchester*, *4*, 23–29.

Bonvallet, M., & Bloch, V. (1961). Bulbar control of cortical arousal. *Science*, *133*(3459), 1133-1134.

Boutcher, S.H. (1992). Attention and athletic performance: An integrated approach. In T.S. Horn (Ed.), *Advances in Sport Psychology* (pp. 251 – 266). Champaign, IL: Human Kinetics.

Boutcher, S. H. (2000). Cognitive performance, fitness and ageing. In S.J.H. Biddle, K.R. Fox & S.H. Boutcher (Eds.), *Physical activity and Psychological Well-being* (pp.118-129). London: Routledge.

Boutcher, S. H., & Crews, D. J. (1987). The effect of a preshot attentional routine on a well-learned skill. *International Journal of Sport Psychology*, *18*(1), 30–39.

Boutcher, S. H., & Landers, D. M. (1988). The effects of vigorous exercise on anxiety, heart rate, and alpha activity of runners and nonrunners. *Psychophysiology*, *25*(6), 696-702.

Boutcher, S. H., & Zinsser, N. W. (1990). Cardiac deceleration of elite and beginning golfers during putting. *Journal of Sport and Exercise Psychology*, *12*(1), 37-47.

Boyer, K. K., Olson, J. R., & Jackson, E. C. (2001). Electronic surveys: Advantages and disadvantages over traditional print surveys. *Decision Line*, *32*(4).

Boynton, P. M. (2004). Administering, analysing, and reporting your questionnaire. *Bmj*, *328*(7452), 1372-1375.

Braden, A. M., Osborne, M. S., & Wilson, S. J. (2015). Psychological intervention reduces self-reported performance anxiety in high school music students. *Frontiers in Psychology*, *6*, 122872.

Broomhead, P., Skidmore, J. B., & Eggett, D. L. (2010). The effect of positive mindset trigger words on the performance expression of non-expert adult singers. *Contributions to Music Education*, *37*, 65–86.

Broomhead, P., Skidmore, J. B., Eggett, D. L., & Mills, M. M. (2012). The effects of a positive mindset trigger word pre-performance routine on the expressive performance of junior high age singers. *Journal of Research in Music Education*, *60*(1), 62-80.

Broomhead, P., Skidmore, J. B., Eggett, D. L., & Mills, M. M. (2018). The effects of a teacher-directed preperformance routine on expressive performance mindset. *Bulletin of the Council for Research in Music Education*, *215*, 57-74.

Brotons, M. (1994). Effects of performing conditions on music performance anxiety and performance quality. *Journal of Music Therapy*, *31*(1), 63-81.

Brugués, A. O. (2011). Music performance anxiety: Part 2: A review of treatment options. *Medical Problems of Performing Artists*, *26*, 164–171.

Bullock, A., Colvin, A. D., & Jackson, M. S. (2022). Zoom fatigue in the age of COVID-19. *Journal of Social Work in the Global Community*, *6*(1), 2.

Buma, L. A., Bakker, F. C., & Oudejans, R. R. (2015). Exploring the thoughts and focus of attention of elite musicians under pressure. *Psychology of Music*, *43*(4), 459-472.

Burke, V. (2010). Performing under pressure. *Management Focus*, *28*, 24-25.

Cahalan, R., & O'Sullivan, K. (2013). Job satisfaction of professional Irish dancers: implications for performer health and well-being. *Journal of Dance Medicine & Science*, *17*(4), 139-149.

Caldwell, R. (1990). The performer prepares. *(No Title)*.

Carlson, E. (1996). Performance Power: Transforming Stress into Creative Energy. *College Music Symposium*, *36*, 166-168.

Carnegie Hall. (n.d.). *How to Prepare for Concerts: Carnegie Hall Master Class* [Video]. YouTube. https://www.youtube.com/watch?v=oKIIDJOt7DA

Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. *Public Health Reports*, *100*(2), 126.

Chang, J. C., Midlarsky, E., & Lin, P. (2003). Effects of meditation on music performance anxiety. *Medical Problems of Performing Artists*, *18*(3), 126-130.

Chanwimalueang, T. (2017). *Bringing complexity science to real world: Quantification of stress in humans and systems*. [Unpublished doctoral dissertation]. Imperial College London.

Clark, T. W. (2010). *Mental skills in music: Investigating use, ability, and training*. [Unpublished doctoral dissertation]. Royal College of Music.

Clark, T., Lisboa, T., & Williamon, A. (2014). An investigation into musicians' thoughts and perceptions during performance. *Research Studies in Music Education*, *36*(1), 19-37.

Clark, T., & Williamon, A. (2011). Evaluation of a mental skills training programme for musicians. *Journal of Applied Sport Psychology*, *23*(3), 342-359.

Cohen, S., & Bodner, E. (2019). Music performance skills: A two-pronged approach–facilitating optimal music performance and reducing music performance anxiety. *Psychology of Music*, *47*(4), 521-538.

Cohen, S., Janicki-Deverts, D., & Miller, G. E. (2007). Psychological stress and disease. *Jama*, *298*(14), 1685-1687.

Cohn, P. J. (1990). Preperformance routines in sport: Theoretical support and practical applications. *The Sport Psychologist*, *4*(3), 301-312.

Cohn, P. J., Rotella, R. J., & Lloyd, J. W. (1990). Effects of a cognitive-behavioral intervention on the preshot routine and performance in golf. *The Sport Psychologist*, *4*(1), 33-47.

Conn, V. S., Hafdahl, A. R., & Brown, L. M. (2009). Meta-analysis of quality-of-life outcomes from physical activity interventions. *Nursing research*, *58*(3), 175.

Connolly, C. & Williamon, A. (2004). Mental skills training. In A. Williamon (Ed.), *Musical Excellence: Strategies and Techniques to Enhance Performance* (pp. 221-245). Oxford: Oxford University Press.

Cotterill, S. (2008). Developing effective pre-performance routines in golf. *Sport & Exercise Psychology Review*, *4*(2), 10-16.

Cotterill, S. (2010). Pre-performance routines in sport: current understanding and future directions. *International Review of Sport and Exercise Psychology*, *3*(2), 132-153.

Cotterill, S. T. (2011). Experiences of developing pre-performance routines with elite cricket players. *Journal of Sport Psychology in Action*, *2*(2), 81-91.

Cotterill, S. (2015). Preparing for performance: strategies adopted across performance domains. *The Sport Psychologist*, *29*(2), 158-170.

Cotterill, S. T., Sanders, R., & Collins, D. (2010). Developing effective pre-performance routines in golf: Why don't we ask the golfer? *Journal of Applied Sport Psychology*, *22*(1), 51-64.

Cox, W. J., & Kenardy, J. (1993). Performance anxiety, social phobia, and setting effects in instrumental music students. *Journal of Anxiety Disorders*, *7*(1), 49-60.

Craig, C., Marshall, A., Sjostrom, M., Bauman, A., Lee, P., Macfarlane, D., Lam, T., & Stewart, S. (2017). International physical activity questionnaire-short form. *J Am Coll Health*, *65*(7), 492-501.

Crampton, J. (1989). Establishing pre-shot routines for tournament golfers: an example of the use of micro-computers in performance planning. *Sports Coach*, *12*, 9-12.

Craske, M. G., & Craig, K. D. (1984). Musical performance anxiety: The three-systems model and self-efficacy theory. *Behaviour Research and Therapy*, *22*(3), 267-280.

Crawford, R. (2014). A multidimensional/non-linear teaching and learning model: Teaching and learning music in an authentic and holistic context. *Music Education Research*, *16*(1), 50-69.

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Crews, D. J., Lutz, R., Nilsson, P., & Marriott, L. (1999). Psychophysiological indicators of confidence and habituation during golf putting. *Science and Golf III: Proceedings of the World Scientific Congress of Golf* (pp. 158-65). Champaign, IL: Human Kinetics.

Cruder, C., Falla, D., Mangili, F., Azzimonti, L., Araújo, L. S., Williamon, A., & Barbero, M. (2018). Profiling the location and extent of musicians' pain using digital pain drawings. *Pain Practice*, *18*(1), 53-66.

Csikszentmihalyi, M. (1990). *Flow. The Psychology of Optimal Experience*. New York: Harper & Row.

Cureton, T. K. (1963). Improvement of psychological states by means of exercise-fitness programs. *Journal of the Association for Physical and Mental Rehabilitation*, *17*, 14-17.

Davidson, J. W. (1999). Self and desire: A preliminary exploration of why students start and continue with music learning. *Research Studies in Music Education*, *12*(1), 30-37.

De Koning, R., Egiz, A., Kotecha, J., Ciuculete, A. C., Ooi, S. Z. Y., Bankole, N. D. A., Erhabor, J., Higginbotham, G., Khan, M., Dalle, D.U., Sichimba, D., Bandyopadhyay, S., & Kanmounye, U. S. (2021). Survey fatigue during the COVID-19 pandemic: an analysis of neurosurgery survey response rates. *Frontiers in Surgery, 8*, 690680.

Dinardi, C., Wortman, A., & Muñoz Hernández, M. (2023). “It’s been a roller coaster”: insights from performing artists on the COVID-19 pandemic and cultural policy. *Cultural Trends*, 1-17.

Dingle, G. A., Brander, C., Ballantyne, J., & Baker, F. A. (2013). ‘To be heard’: the social and mental health benefits of choir singing for disadvantaged adults. *Psychology of Music*, *41*(4), 405-421.

Dishman, R. K. (1982). Contemporary sport psychology. *Exercise and Sport Sciences Reviews*, *10*(1), 120-159.

Douglas, K., & Fox, K. R. (2002). Performance and practise of elite women European tour golfers during pressure and non-pressure putting simulation. In E. Thain (Ed.), *Science and Golf IV* (pp. 246-256). London: Routledge.

Easterbrook, J. A. (1959). The effect of emotion on cue utilization and the organization of behavior. *Psychological Review*, *66*(3), 183.

Edwards, S. (2006). Physical exercise and psychological well-being. *South African Journal of Psychology*, *36*(2), 357-373.

El-Naggar, M. (1986). Physical training effect on relationship of physical, mental, and emotional fitness in adult men. *Journal of Human Ergology*, *15*(1), 79-84.

Emmons, S., & Thomas, A. (1998). *Power performance for singers: Transcending the barriers*. Oxford University Press.

Esplen, M. J., & Hodnett, E. (1999). A pilot study investigating student musicians' experiences of guided imagery as a technique to manage performance anxiety. *Medical problems of performing artists*, *14*(3), 127-132.

Evans, J., Macrory, I., & Randall, C. (2015). Measuring national wellbeing: Life in the UK, 2015.

Fancourt, D., Steptoe, A., & Bu, F. (2021). Trajectories of anxiety and depressive symptoms during enforced isolation due to COVID-19 in England: a longitudinal observational study. *Lancet Psychiatry*, *8*, 141–149.

Fishbein, M., Middlestadt, S. E., Ottati, V., Straus, S., & Ellis, A. (1988). Medical problems among ICSOM musicians: overview of a national survey. *Medical Problems of Performing Artists*, *3*(1), 1-8.

Forde, C. (2018). Scoring the international physical activity questionnaire (IPAQ). *University of Dublin*, *3*.

Foster, D. J., Weigand, D. A., & Baines, D. (2006). The effect of removing superstitious behavior and introducing pre-performance routine on basketball free-throw performance. *Journal of Applied Sport Psychology*, *18*, 167-171.

Foster, W. C. (1998). *Singing Redefined: A Conceptual Approach to Singing that Includes a Study of the Emotional Process and the Imaginative Capacity, Linguistic Awareness and Musical Awareness, Singing Concepts Based on the Responsive Nature of the Instrument, and Exercises Designed to Promote a Technically Correct, Artistically Expressive Singing Tone*. Recital Publications.

Fox, K. R. (1997). The physical self and processes in self-esteem development. In K. R. Fox (Ed.), *The Physical Self from Motivation to Well-being* (pp. 111-140). Champaing, JL: Human Kinetics.

Fox, K.R. (2000). Self-esteem, self-perceptions and exercise, *International Journal of Sport Psychology*, *31*, 228-240.

Fox, K. R. (2003). The effects of exercise on self-perceptions and self-esteem. In S.J.H. Biddle & K.R. Fox (Eds.), *Physical activity and Psychological Well-being*, (pp.100-119). London: Routledge.

Frederickson, K. B. (2002). Fit to play: Musicians' health tips. *Music Educators Journal*, *88*(6), 38-44.

Fredrikson, M., & Gunnarsson, R. (1992). Psychobiology of stage fright: the effect of public performance on neuroendocrine, cardiovascular and subjective reactions. *Biological Psychology*, *33*(1), 51-61.

Gabrielsson, A. (1999). The performance of music. In *The Psychology of Music* (pp. 501-602). Academic Press.

Araujo, L., & Garden, P. (2023, August 17-20). How to get started? Principles for culture change, performance, and wellbeing in orchestral settings [Paper presentation]. International Symposium on Performance Science, Warsaw, Poland.

Gates, G. A., Johnson, L., Saegert, J., Shepherd, A., Wilson, N., & Erwin III, M. H. (1985). Effect of β blockade on singing performance. *Annals of Otology, Rhinology & Laryngology*, *94*(6), 570-574.

Gould, D., & Udry, E. (1994). Psychological skills for enhancing performance: arousal regulation strategies. *Medicine and Science in Sports and Exercise*, *26*(4), 478-485.

Gov.uk, (2021). *Wellbeing and Loneliness – Community Life Survey 2020/21. https://www.gov.uk/government/statistics/community-life-survey-202021-wellbeing-and-loneliness/wellbeing-and-loneliness-community-life-survey-202021.*

Green, B. (1982). Inner game of music. *American String Teacher*, *32*(1), 12-15.

Gregersen, E. M., Astrupgaard, S. L., Jespersen, M. H., Gårdhus, T. P., & Albris, K. (2023). Digital dependence: Online fatigue and coping strategies during the COVID-19 lockdown. *Media, Culture & Society*, 01634437231154781.

Gröpel, P., & Mesagno, C. (2019). Choking interventions in sports: A systematic review. *International Review of Sport and Exercise Psychology*, *12*(1), 176-201.

Guthold, R., Ono, T., Strong, K. L., Chatterji, S., & Morabia, A. (2008). Worldwide variability in physical inactivity: a 51-country survey. *American Journal of Preventive Medicine*, *34*(6), 486-494.

Hagstromer, M., Ainsworth, B. E., Oja, P., & Sjostrom, M. (2010). Comparison of a subjective and an objective measure of physical activity in a population sample. *Journal of Physical Activity and Health*, *7*(4), 541-550.

Hall, E. G., & Erffmeyer, E. S. (1983). The effect of visuo-motor behavior rehearsal with videotaped modeling on free throw accuracy of intercollegiate female basketball players. *Journal of sport psychology*, *5*(3).

Hallam, S. (1998). *Instrumental teaching: A practical guide to better teaching and learning*. Oxford: Heinemann.

Hallam, S. (2003). Supporting students in learning to perform. Norges musikkhogskole.

Hanin, Y. L. (2000). Individual Zones of Optimal Functioning (IZOF) Model: Emotion-performance relationship in sport. In Y. L. Hanin (Ed.), *Emotions in Sport* (pp. 65–89). Human Kinetics.

Hanton, S. & Jones, G. (1999a). The acquisition and development of cognitive skills and strategies: I. Making the butterflies fly in formation. *The Sport Psychologist, 13,* 1-21.

Hanton, S., Wadey, R., & Mellalieu, S. D. (2008). Advanced psychological strategies and anxiety responses in sport. *The Sport Psychologist*, *22*(4), 472-490.

Hardy, L., Jones, G., & Hardy, L. (1990). A catastrophe model of performance in sport. In J.G. Jones & L. Hardy (Eds.), *Stress and performance in sport* (pp.81-106). England: Willey.

Hardy, L., Mullen, R., & Martin, N. (2001). Effect of task-relevant cues and state anxiety on motor performance. *Perceptual and Motor Skills*, *92*(3), 943-946.

Harle, S. K., & Vickers, J. N. (2001). Training quiet eye improves accuracy in basketball free throw. *The Sport Psychologist, 15*, 289-305.

Harmat, L., de Manzano, Ö., & Ullén, F. (2021). Flow in music and arts. In *Advances in flow research* (pp. 377-391). Cham: Springer International Publishing.

Harper, B. S. (2002). Workplace and health: A survey of classical orchestral musicians in the United Kingdom and Germany. *Medical Problems of Performing Artists*, *17*(2), 83-92.

Hatfield, J. L. (2016). Performing at the top of one's musical game. *Frontiers in Psychology*, *7*, 208664.

Hawes, M. T., Szenczy, A. K., Klein, D. N., Hajcak, G., & Nelson, B. D. (2022). Increases in depression and anxiety symptoms in adolescents and young adults during the COVID-19 pandemic. *Psychological Medicine*, *52*(14), 3222-3230.

Hawkes, M. E. (2021). Experiences of developing pre-performance routines with recreational pianists. *Psychology of Music*, *49*(6), 1721-1736.

Hays, K. F. (2002). The enhancement of performance excellence among performing artists. *Journal of Applied Sport Psychology*, *14*(4), 299-312.

Hays, K., Thomas, O., Butt, J., & Maynard, I. (2010). The development of confidence profiling for sport. *The Sport Psychologist*, *24*(3), 373-392.

Hazell, J., Cotterill, S. T., & Hill, D. M. (2014). An exploration of pre-performance routines, self-efficacy, anxiety and performance in semi-professional soccer. *European Journal of Sport Science*, *14*(6), 603-610.

Hill, D. M., Hanton, S., Matthews, N., & Fleming, S. (2010). A qualitative exploration of choking in elite golf. *Journal of Clinical Sport Psychology*, *4*(3), 221-240.

Hill, D. M., Hanton, S., Matthews, N., & Fleming, S. (2011). Alleviation of choking under pressure in elite golf: An action research study. *The Sport Psychologist*, *25*(4), 465-488.

Hill, D. M., & Shaw, G. (2013). A qualitative examination of choking under pressure in team sport. *Psychology of Sport and Exercise*, *14*(1), 103-110.

Hobson, M. L., & Rejeski, W. J. (1993). Does the dose of acute exercise mediate psychophysiological responses to mental stress? *Journal of Sport and Exercise Psychology*, *15*(1), 77-87.

Hoffman, S. L., & Hanrahan, S. J. (2012). Mental skills for musicians: Managing music performance anxiety and enhancing performance. *Sport, Exercise, and Performance Psychology*, *1*(1), 17.

Holder, T., Greenlees, I., & Moran, A. (2003). Concentration training for closed skills. Pre-performance routine. In I. Greenlees & A. Moran (Eds.), *Concentration skills training in sport* (pp. 67-75). Leicester: The British Psychological Society.

Holmes, P. (2005). Imagination in practice: A study of the integrated roles of interpretation, imagery and technique in the learning and memorisation processes of two experienced solo performers. *British Journal of Music Education*, *22*(3), 217-235.

Huang, K., & Ihm, J. (2021). Sleep and injury risk. *Current Sports Medicine Reports*, *20*(6), 286-290.

Hughes, M. E., Waite, L. J., Hawkley, L. C., & Cacioppo, J. T. (2004). A short scale for measuring loneliness in large surveys: Results from two population-based studies. *Research on Aging*, *26*(6), 655-672.

Iñesta, C., Terrados, N., García, D., & Pérez, J. A. (2008). Heart rate in professional musicians. *Journal of Occupational Medicine and Toxicology*, *3*(1), 1-11.

Institute for Government, (2022, December 9). *Analysis Timeline of UK government coronavirus lockdowns and measures, March 2020 to December 2021.* https://www.instituteforgovernment.org.uk/data-visualisation/timeline-coronavirus-lockdowns.

Iwamoto, G. A., & Kaufman, M. P. (1987). Caudal ventrolateral medullary cells responsive to muscular contraction. *Journal of Applied Physiology*, *62*(1), 149-157.

Jachimecki, Z. (1937). Chopin, Fryderyk Franciszek. *Polski Słownik Biograficzny, 3*, 420-426.

Jackson, R. C. (2003). Pre-performance routine consistency: temporal analysis of goal kicking in the Rugby Union World Cup. *Journal of Sports Sciences, 21,* 803-814.

Jackson, R.C., Ashford, K. J., & Norsworthy, G. (2006). Attentional focus, dispositional reinvestment, and skilled motor performance under pressure. *Journal of Sport & Exercise Psychology, 28*, 49–68.

Jackson, R.C., & Baker, J. S. (2001). Routines, Rituals, and Rugby: Case study of a world class goal kicker. *The Sport Psychologist*, *15*, 48-65.

James, I. (1998). Western orchestral musicians are highly stressed. *Resonance: International Music Council*, *26*, 19-20.

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational researcher*, *33*(7), 14-26.

Jordet, G., & Hartman, E. (2008). Avoidance motivation and choking under pressure in soccer penalty shootouts. *Journal of Sport and Exercise Psychology*, *30*(4), 450-457.

Kahlmeier, S., Wijnhoven, T. M., Alpiger, P., Schweizer, C., Breda, J., & Martin, B. W. (2015). National physical activity recommendations: systematic overview and analysis of the situation in European countries. *BMC Public Health*, *15,* 1-14.

Kahneman, D. (1973). *Attention and Effort*. Englewood Cliffs, NJ: Prentice-Hall.

Kao, S. C., Huang, C. J., & Hung, T. M. (2013). Frontal midline theta is a specific indicator of optimal attentional engagement during skilled putting performance. *Journal of Sport and Exercise Psychology*, *35*(5), 470-478.

Kapteyn, A., Banks, J., Hamer, M., Smith, J. P., Steptoe, A., Van Soest, A., Koster, A. & Wah, S. H. (2018). What they say and what they do: comparing physical activity across the USA, England and the Netherlands. *Journal of Epidemiology Community Health*, *72*(6), 471-476.

Karim, J., Weisz, R., Bibi, Z., & ur Rehman, S. (2015). Validation of the eight-item center for epidemiologic studies depression scale (CES-D) among older adults. *Current Psychology*, *34*, 681-692.

Kayani, S., Wang, J., Biasutti, M., Zagalaz Sánchez, M. L., Kiyani, T., & Kayani, S. (2020). Mechanism between physical activity and academic anxiety: Evidence from Pakistan. *Sustainability*, *12*(9), 3595.

Kayani, S., Kiyani, T., Kayani, S., Morris, T., Biasutti, M., & Wang, J. (2021). Physical activity and anxiety of Chinese university students: mediation of self-system. *International Journal of Environmental Research and Public Health*, *18*(9), 4468.

Kegelaers, J., Schuijer, M., & Oudejans, R. R. (2021). Resilience and mental health issues in classical musicians: a preliminary study. *Psychology of Music*, *49*(5), 1273-1284.

Kegelaers, J., Hoogkamer, L., & Oudejans, R. R. (2022). Practice and performance management strategies of emerging professional musicians in preparation for orchestra auditions. *Research Studies in Music Education*, *44*(1), 175-191.

Kellman, M. (2010). Overtraining and recovery. In S.J. Hanrahan & M.B. Anderson (Eds.), *Routledge Handbook of Applied Sport Psychology* (pp. 292-302). Abingdon: Routledge.

Kemp, A. E. (1996). *The Musical Temperament: Psychology and Personality of Musicians*. Oxford: Oxford University Press.

Kenny, D. (2011). *The Psychology of Music Performance Anxiety*. Oxford: Oxford University Press.

Kenny, D. T. (2010). The role of negative emotions in performance anxiety. In P. Juslin & J. Sloboda (Eds.), *Handbook of music and emotion: Theory, research, applications* (pp. 425-451). Oxford: Oxford University Press.

Kenny, D., & Ackermann, B. (2015). Performance-related musculoskeletal pain, depression and music performance anxiety in professional orchestral musicians: a population study. *Psychology of Music*, *43*(1), 43-60.

Kenny, D., Driscoll, T., & Ackermann, B. (2014). Psychological well-being in professional orchestral musicians in Australia: A descriptive population study. *Psychology of Music*, *42*(2), 210-232.

Kenny, D. T., & Ackermann, B. (2009). Optimizing physical and psychological health in performing musicians. *The Oxford Handbook of Music Psychology*. Oxford: Oxford University Press.

Kenny, D. T., Davis, P., & Oates, J. (2004). Music performance anxiety and occupational stress amongst opera chorus artists and their relationship with state and trait anxiety and perfectionism. *Journal of Anxiety Disorders*, *18*(6), 757-777.

Kenny, D. T., & Halls, N. (2018). Development and evaluation of two brief group interventions for music performance anxiety in community musicians. *Psychology of Music*, *46*(1), 66-83.

Kenny, D. T., & Osborne, M. S. (2006). Music performance anxiety: New insights from young musicians. *Advances in Cognitive Psychology*, *2*(2-3), 103-112.

Kerr, J. H. (1987). Cognitive intervention with elite performers: reversal theory. *British Journal of Sports Medicine*, *21*(2), 29-33.

Keyes, C. L. (2002). The mental health continuum: From languishing to flourishing in life. *Journal of Health and Social Behavior*, *43*, 207-222.

Keyes, C. L. (2005). Mental illness and/or mental health? Investigating axioms of the complete state model of health. *Journal of Consulting and Clinical Psychology*, *73*(3), 539.

Kim, J. H., & McKenzie, L. A. (2014). The impacts of physical exercise on stress coping and well-being in university students in the context of leisure. *Health*, *6*(19), 2570.

Kirchner, J. M. (2011). Incorporating flow into practice and performance. *Work*, *40*(3), 289-296.

Klaperski, S., Koch, E., Hewel, D., Schempp, A., & Müller, J. (2019). Optimizing mental health benefits of exercise: The influence of the exercise environment on acute stress levels and wellbeing. *Mental Health & Prevention*, *15*, 200173.

Kokotsaki, D., & Davidson, J. W. (2003). Investigating musical performance anxiety among music college singing students: A quantitative analysis. *Music Education Research*, *5*(1), 45-59.

Kramer, A. F., & Erickson, K. I. (2007). Capitalizing on cortical plasticity: influence of physical activity on cognition and brain function. *Trends in cognitive sciences*, *11*(8), 342-348.

Kreutz, G., Ginsborg, J., & Williamon, A. (2008). Music students' health problems and health-promoting behaviours. *Medical Problems of Performing Artists*, *23*(1), 3-11.

Kreutz, G., Ginsborg, J., & Williamon, A. (2009). Health-promoting behaviours in conservatoire students. *Psychology of Music*, *37*(1), 47-60.

Kyriacou, C. P., & Hastings, M. H. (2010). Circadian clocks: genes, sleep, and cognition. *Trends in Cognitive Sciences*, *14*(6), 259-267.

Lamont, A., Daubney, A., & Spruce, G. (2012). Singing in primary schools: case studies of good practice in whole class vocal tuition. *British Journal of Music Education*, *29*(2), 251-268.

Lang, P. J., & McTeague, L. M. (2009). The anxiety disorder spectrum: Fear imagery, physiological reactivity, and differential diagnosis. *Anxiety, Stress, & Coping*, *22*(1), 5-25.

Larson, E. B., Wang, L. I., Bowen, J. D., McCormick, W. C., Teri, L., Crane, P., & Kukull, W. (2006). Exercise is associated with reduced risk for incident dementia among persons 65 years of age and older. *Annals of Internal Medicine*, *144*(2), 73-81.

Lautenbach, F., Laborde, S., Mesagno, C., Lobinger, B. H., Achtzehn, S., & Arimond, F. (2015). Nonautomated pre-performance routine in tennis: An intervention study. *Journal of Applied Sport Psychology*, *27*(2), 123-131.

Lawton, G. W., Hung, T. M., Saarela, P., & Hatfield, B. D. (1998). Electroencephalography and mental states associated with elite performance. *Journal of Sport and Exercise Psychology*, *20*(1), 35-53.

Lazarus, A. A., & Abramovitz, A. (2004). A multimodal behavioral approach to performance anxiety. *Journal of Clinical Psychology*, *60*(8), 831-840.

Lazarus, R. S. & Folkman, S. (1984). *Stress, Appraisal and Coping.* New York: Springer.

LeBlanc, A., Jin, Y. C., Obert, M., & Siivola, C. (1997). Effect of audience on music performance anxiety. *Journal of Research in Music Education, 45*(3), 480-496.

Lederman, R. J. (1999). Medical treatment of performance anxiety: a statement in favor. *Medical Problems of Performing Artists*, *14*(3), 117-121.

Lee, R. M., Dean, B. L., & Jung, K. R. (2008). Social connectedness, extraversion, and subjective well-being: Testing a mediation model. *Personality and Individual Differences*, *45*(5), 414-419.

Lehrer, P. M. (1981). What is performance anxiety? A psychological study of the responses of musicians to a questionnaire about performance anxiety. *Proceedings of the International Conference on Tension in Performance* (pp.75-96). Kingston Polytechnic, UK.

Lehrer, P. M., Goldman, N. S., & Strommen, E. F. (1990). A principal components assessment of performance anxiety among musicians. *Medical Problems of Performing Artists*, *5*(1), 12-18.

Liao, C., & Masters, R. S. W. (2001). Analogy learning: A means to implicit motor learning. *Journal of Sports Sciences*, *19*, 307–319.

Lidor, R., & Mayan, Z. (2005). Can beginning learners benefit from preperformance routines when serving in volleyball? *The Sport Psychologist*, *19*(4), 343-363.

Lidor, R., & Singer, R. N. (2000). Teaching preperformance routines to beginners. *Journal of Physical Education, Recreation & Dance*, *71*(7), 34-36.

Lockwood, A. H. (1989). Medical problems of musicians. *New England Journal of Medicine*, *320*(4), 221-227.

Lorenc, A. B., Wang, Y., Madge, S. L., Hu, X., Mian, A. M., & Robinson, N. (2014). Meditative movement for respiratory function: a systematic review. *Respiratory Care*, *59*(3), 427-440.

Loyen, A., Van Hecke, L., Verloigne, M., Hendriksen, I., Lakerveld, J., Steene-Johannessen, J., Vuillemin, A., Koster, A., Donnelly, A., Ekelund, U., Deforche, B., De Bourdeaudhuij, I., Brug, J. & Van der Ploeg, H. P. (2016). Variation in population levels of physical activity in European adults according to cross-European studies: a systematic literature review within DEDIPAC. *International Journal of Behavioral Nutrition and Physical Activity*, *13*(1), 1-18.

Mack, M. G. (2001). Effects of time and movements of the preshot routine on free throw shooting. *Perceptual and Motor Skills*, *93*(2), 567-573.

Martens, R., Vealey, R. S., & Burton, D. (1990). *Competitive Anxiety in Sport.* Champaign: Human Kinetics.

Matei, R., & Ginsborg, J. (2017). Music performance anxiety in classical musicians: What we know about what works. *BJPsych International, 14*(2), 33–35.

Matei, R., & Ginsborg, J. (2020). Physical activity, sedentary behaviour, anxiety, and pain among musicians in the United Kingdom. *Frontiers in Psychology*, *11*, 560026.

Maynard, I. W. (1998). *Improving concentration*. Leeds: National Coaching Foundation.

McCormick, J., & McPherson, G. (2003). The role of self-efficacy in a musical performance examination: An exploratory structural equation analysis. *Psychology of Music*, *31*(1), 37-51.

Mesagno, C., & Beckmann, J. (2017). Choking under pressure: Theoretical models and interventions. *Current Opinion in Psychology, 16, 170-175.*

Mesagno, C., & Hill, D. M. (2013). Definition of choking in sport: Re-conceptualization and debate. *International Journal of Sport Psychology, 44, 267–277.*

Mesagno, C., Hill, D. M., & Larkin, P. (2015). Examining the accuracy and in-game performance effects between pre-and post-performance routines: A mixed methods study. *Psychology of Sport and Exercise*, *19*, 85-94.

Mesagno, C., Marchant, D., & Morris, T. (2008). A pre-performance routine to alleviate choking in “choking-susceptible” athletes. *The Sport Psychologist*, *22*(4), 439-457.

Mesagno, C., Marchant, D., & Morris, T. (2009). Alleviating choking: The sounds of distraction. *Journal of Applied Sport Psychology*, *21*(2), 131-147.

Mesagno, C., & Mullane-Grant, T. (2010). A comparison of different pre-performance routines as possible choking interventions. *Journal of Applied Sport Psychology*, *22*(3), 343-360.

Middlestadt, S. E., & Fishbein, M. (1988). Health and occupational correlates of perceived occupational stress in symphony orchestra musicians. *Journal of Occupational Medicine*, *30*(9), 687-692.

Miklaszewski, K. (1989). A case study of a pianist preparing a musical performance. *Psychology of Music*, *17*(2), 95-109.

Mojtabai, R., Olfson, M., & Han, B. (2016). National trends in the prevalence and treatment of depression in adolescents and young adults. *Pediatrics, 138*(6).

Mor, S., Day, H. I., Flett, G. L., & Hewitt, P. L. (1995). Perfectionism, control, and components of performance anxiety in professional artists. *Cognitive Therapy and Research, 19*, 207-225.

Moran, A. P. (1996). *The psychology of concentration in sports performers: a cognitive analysis*. Hove: Psychology Press.

Morgan, D. L. (1998). Practical strategies for combining qualitative and quantitative methods: Applications to health research. *Qualitative Health Research*, *8*(3), 362-376.

Morgan, D. L. (2007). Paradigms lost and pragmatism regained: Methodological implications of combining qualitative and quantitative methods. *Journal of Mixed Methods Research*, *1*(1), 48-76.

Morgan, W. P. (1970). Physical fitness correlates of psychiatric hospitalization. In Kenyon (Ed.), *Contemporary Psychology of Sport* (pp. 297–300), Athletic Institute, Chicago, 1970a.

Morgan, W. P., & Goldston, S. E. (2013). *Exercise and Mental Health*. Taylor & Francis.

Morgan, W. P., Horstman, D. H., Cymerman, A., & Stokes, J. (1980). Exercise as a relaxation technique. *Primary Cardiology, 6*, 48-57.

Morse, J. M. (2015). Critical analysis of strategies for determining rigor in qualitative inquiry. *Qualitative Health Research*, *25*(9), 1212-1222.

Mullen, R., Hardy, L., & Tattersall, A. (2005). State anxiety and motor performance: Testing the conscious processing hypothesis. *Journal of Sports Sciences*, *18,* 785–799.

Murphy, S. (2002). Mental preparation for golf: Achieving optimal performance. In A.J. Cochrane & M.R. Farrally (Eds.), *Science and Golf II: Proceedings of the world scientific congress of golf* (pp. 195-202). Taylor & Francis.

Mutrie, N. (2003). The relationship between physical activity and clinically defined depression. In S.J.H. Biddle, K.R. Fox & S.H. Boutcher (Eds.), *Physical Activity and Psychological Well-being* (pp.166-173). London: Routledge.

Myers, E. (2002). Fever pitch. *Opera News, 67(5),* pp.36-42.

Nube, J. (1991). Beta-blockers: Effects on performing musicians. *Medical Problems of Performing Artists*, *6*(2), 61-68.

Nyman, T., Wiktorin, C., Mulder, M., & Johansson, Y. L. (2007). Work postures and neck–shoulder pain among orchestra musicians. *American Journal of Industrial Medicine*, *50*(5), 370-376.

Office for National Statistics (ONS) (2020). *Parenting in Lockdown: Coronavirus and the Effects on Work-Life Balance*.

Office of Disease Prevention and Health Promotion (2008). *Physical Activity Guidelines for Americans. Be Active, Healthy and Happy!* Washington, DC: United States Department of Health and Human Services.

Osborne, M. S., Greene, D. J., & Immel, D. T. (2014). Managing performance anxiety and improving mental skills in conservatoire students through performance psychology training: a pilot study. *Psychology of Well-Being*, *4*, 1-17.

Osborne, M. S., & Kenny, D. T. (2005). Development and validation of a music performance anxiety inventory for gifted adolescent musicians. *Journal of Anxiety Disorders*, *19*(7), 725-751.

Ostwald, P. F. (1987). Psychotherapeutic strategies in the treatment of performing artists. *Medical Problems of Performing Artists*, *2*(4), 131-136.

Otto, J., Gentner, N., Czech, D., Burdette, T., & Biber, D. (2014). Baseball pitchers pre-performance. *Mission of the Journal of Excellence, 16,* 84.

Panebianco-Warrens, C. R., Fletcher, L., & Kreutz, G. (2015). Health-promoting behaviours in South African music students: A replication study. *Psychology of Music*, *43*(6), 779-792.

Papageorgi, I. (2007). *Understanding Performance Anxiety in the Adolescent Musician*. [Unpublished doctoral dissertation]. Institute of Education, University of London.

Papageorgi, I., Hallam, S., & Welch, G. F. (2007). A conceptual framework for understanding musical performance anxiety. *Research Studies in Music Education*, *28*(1), 83-107.

Paprocki, D. A. (1999). It's all in the mind: Performance anxiety and sport training. *Clarinet*, *26*, 75-76.

Parasuraman, S., & Purohit, Y. S. (2000). Distress and boredom among orchestra musicians: the two faces of stress. *Journal of Occupational Health Psychology, 5*(1), 74.

Partington, J. (1995). *Making Music.* Ottawa: Carlton University Press.

Patston, T. (1996). *Performance Anxiety in Opera Singers*. [Unpublished master's thesis]. Sydney Conservatorium of Music, University of Sydney, Australia.

Patston, T., & Loughlan, T. (2014). Playing with performance: The use and abuse of beta-blockers in the performing arts. *Victorian Journal of Music Education*, *1*, 3-10.

Petruzzello, S. J., Landers, D. M., Hatfield, B. D., Kubitz, K. A., & Salazar, W. (1991). A meta-analysis on the anxiety-reducing effects of acute and chronic exercise: Outcomes and mechanisms. *Sports Medicine*, *11*, 143-182.

Phelps, J. R. (1987). Physical activity and health maintenance—exactly what is known? *Western Journal of Medicine*, *146*(2), 200.

Plaut, E. A. (1990). Psychotherapy of performance anxiety. *Medical Problems of Performing Artists*, *5*(1), 58-63.

Radlo, S. J., Steinberg, G. M., Singer, R. N., Barba, D. A., & Melnikov, A. (2002). The influence of an attentional focus strategy on alpha brain wave activity, heart rate and dart-throwing performance. *International Journal of Sport Psychology*, *33*, 205-217.

Reubart, D. (1985). *Anxiety and musical performance: On playing the piano from memory*. New York: Da Capo Press.

Rejeski, W. J., Thompson, A., Brubaker, P. H., & Miller, H. S. (1992). Acute exercise: buffering psychosocial stress responses in women. *Health Psychology*, *11*(6), 355.

Rickert, D. L., Barrett, M. S., & Ackermann, B. J. (2014). Injury and the orchestral environment: part II. Organisational culture, behavioural norms, and attitudes to injury. *Medical problems of Performing Artists*, *29*(2), 94-101.

Riley, J. M. (2012). Reducing anxiety: Studio strategies for performing salvation. *Music Educators Journal*, *98*(3), 65-70.

Ritchie, L., & Williamon, A. (2011). Measuring distinct types of musical self-efficacy. *Psychology of Music*, *39*(3), 328-344.

Robson, B., Davidson, J., & Snell, E. (1995). "But I'm not ready, yet": overcoming audition anxiety in the young musician. *Medical Problems of Performing Artists*, *10*(1), 32-37.

Roland, D. J. (1993). *The development and evaluation of a modified cognitive-behavioural treatment for musical performance anxiety*. Australia. University of Wollongong.

Roland, D. (1994). How Professional Performers Manage Performance Anxiety. *Research Studies in Music Education*, *2*(1), 25–35.

Rossman, G. B., & Wilson, B. L. (1985). Numbers and words: Combining quantitative and qualitative methods in a single large-scale evaluation study. *Evaluation Review*, *9*(5), 627-643.

Russell, D., Peplau, L. A., & Cutrona, C. E. (1980). The revised UCLA Loneliness Scale: concurrent and discriminant validity evidence. *Journal of Personality and Social Psychology*, *39*(3), 472.

Sataloff, R. T., Rosen, D. C., & Levy, S. (1999). Medical treatment of performance anxiety: A comprehensive approach. *Medical Problems of Performing Artists*, *14*(3), 122-126.

Seligman, M. E. P. (2008). Positive health. *Applied Psychology*, *57*(1), 3–18.

Selye, H. (1936). A syndrome produced by diverse nocuous agents. *Nature*, *138*(3479), 32-32.

Shaw, D. (2002). Confidence and the pre-shot routine in golf: A case study. *Solutions in Sport Psychology*, *1*, 108-119.

Shaw, R.L. (2001). Why use interpretive phenomenological analysis in health psychology? *Health Psychology Update, 10,* 48-52.

Singer, R. N. (1988). Strategies and metastrategies in learning and performing self-paced athletic skills. *The Sport Psychologist*, *2*(1), 49-68.

Singer, R. N. (2002). Preperformance state, routines, and automaticity: What does it take to realize expertise in self-paced events? *Journal of Sport and Exercise Psychology*, *24*(4), 359-375.

Smith, J. A., & Osborn, M. (2008). Interpretative phenomenological analysis. In J.A. Smith (Ed.), *Qualitative Psychology: A Practical Guide to Research Methods* (pp.53-80). London: Sage.

Smith, J. A., & Osborn, M. (2015). Interpretative phenomenological analysis as a useful methodology for research on the lived experience of pain. *British Journal of Pain*, *9*(1), 41-42.

Spiro, N., Perkins, R., Kaye, S., Tymoszuk, U., Mason-Bertrand, A., Cossette, I., Glasser, S., & Williamon, A. (2021). The effects of COVID-19 lockdown 1.0 on working patterns, income, and wellbeing among performing arts professionals in the United Kingdom (April–June 2020). *Frontiers in Psychology*, *11*, 4105.

Stanton, H. E. (1993). Research note: Alleviation of performance anxiety through hypnotherapy. *Psychology of Music*, *21*(1), 78-82.

Stanton, H. E. (1994). Reduction of performance anxiety in music students. *Australian Psychologist*, *29*(2), 124-127.

Steinmetz, A., Scheffer, I., Esmer, E., Delank, K. S., & Peroz, I. (2015). Frequency, severity and predictors of playing-related musculoskeletal pain in professional orchestral musicians in Germany. *Clinical Rheumatology*, *34*, 965-973.

Steptoe, A. (1983). The relationship between tension and the quality of musical performance. *Journal of the International Society for the Study of Tension in Performance*, *1*(1), 12-22.

Steptoe, A. (1989). Stress, coping and stage fright in professional musicians. *Psychology of Music*, *17*(1), 3-11.

Steptoe, A. (2001). Negative Emotions in Music Making: The Problem of Performance Anxiety. In P.N. Juslin & A. John (Eds.), *Music and Emotion* (pp.291-307). New York: Oxford University Press.

Steptoe, A., & Cox, S. (1988). Acute effects of aerobic exercise on mood. *Health Psychology*, *7*(4), 329.

Steptoe, A., & Fidler, H. (1987). Stage fright in orchestral musicians: A study of cognitive and behavioural strategies in performance anxiety. *British Journal of Psychology*, *78*(2), 241-249.

Steptoe, A., Kearsley, N., & Walters, N. (1993). Cardiovascular activity during mental stress following vigorous exercise in sportsmen and inactive men. *Psychophysiology*, *30*(3), 245-252.

Steptoe, A., Malik, F., Pay, C., Pearson, P., Price, C., & Win, Z. (1995). The impact of stage fright on student actors. *British Journal of Psychology*, *86*(1), 27-39.

Steptoe, A., Shankar, A., Demakakos, P., & Wardle, J. (2013). Social isolation, loneliness, and all-cause mortality in older men and women. *Proceedings of the National Academy of Sciences*, *110*(15), 5797-5801.

Steyn, B. J., Steyn, M. H., Maree, D. J., & Panebianco-Warrens, C. (2015). A cross-over from sport psychology to the psychology of music: An intervention study on undergraduate music students. *African Journal for Physical Health Education, Recreation and Dance*, *21*(2), 596-611.

Su, Y. H., Luh, J. J., Chen, H. I., Lin, C. C., Liao, M. J., & Chen, H. S. (2010). Effects of using relaxation breathing training to reduce music performance anxiety in 3rd to 6th graders. *Medical Problems of Performing Artists*, *25*(2), 82-86.

Sweeney, G. A., & Horan, J. J. (1982). Separate and combined effects of cue-controlled relaxation and cognitive restructuring in the treatment of musical performance anxiety. *Journal of Counseling Psychology*, *29*(5), 486.

Sylvia, L. G., Bernstein, E. E., Hubbard, J. L., Keating, L., & Anderson, E. J. (2014). A practical guide to measuring physical activity. *Journal of the Academy of Nutrition and Dietetics*, *114*(2), 199.

Talbot-Honeck, C. & Orlick, T. (1998). The essence of excellence: Mental links of top classical musicians. *Journal of Excellence, 1,* 61-75.

Taylor A. (2014). Using interpretative phenomenological analysis in a mixed methods research design to explore music in the lives of mature age amateur keyboard players. *Music Education Research*, *17*(4), 437–452.

Taylor, A. & Wasley, D. (2004). Physical Fitness. In A. Williamon (Ed.), *Musical excellence: Strategies and techniques to enhance performance* (pp.163-178). Oxford University Press.

Taylor, A. H. (2003). Physical activity, anxiety, and stress. In S.J.H. Biddle & S.H. Boutcher (Eds.), *Physical activity and Psychological Well-being* (pp.10-45). London: Routledge.

Tief, V. J., & Gröpel, P. (2021). Pre-performance routines for music students: An experimental pilot study. *Psychology of Music*, *49*(5), 1261-1272.

Trinity Laban Conservatoire of Music and Dance, (2023). *Screening and profiling for professional dancers.* https://www.trinitylaban.ac.uk/study/dance/dance-science/products-and-services/screening-and-profiling-for-professional-dancers/#:~:text=Assessments%20are%20designed%20to%20uncover,injury%20risks%20through%20specific%20training.

Tymoszuk, U., Spiro, N., Perkins, R., Mason-Bertrand, A., Gee, K., & Williamon, A. (2021). Arts engagement trends in the United Kingdom and their mental and social wellbeing implications: HEartS survey. *PLoS One*, *16*(3), e0246078.

US Department of Health and Human Services, (2008). *Physical Activity Guidelines Advisory Committee Report*. Washington (DC): ODPHP Publication No. U0049, 2008.

Vaag, J., Bjørngaard, J. H., & Bjerkeset, O. (2016). Symptoms of anxiety and depression among Norwegian musicians compared to the general workforce. *Psychology of Music*, *44*(2), 234-248.

Valentine, E. (2002). The fear of performance. In J. Rink (Ed.) *Musical Performance: A guide to Understanding* (pp.168-182). Cambridge: Cambridge University Stress.

Valentine, E. R., Fitzgerald, D. F., Gorton, T. L., Hudson, J. A., & Symonds, E. R. (1995). The effect of lessons in the Alexander technique on music performance in high and low stress situations. *Psychology of Music*, *23*(2), 129-141.

Valentine, E. R., Meyer-Dinkgräfe, D., Acs, V., & Wasley, D. (2006). Exploratory investigation of South Indian techniques and neurolinguistic programming as methods of reducing stage fright in actors. *Medical Problems of Performing Artists*, *21*(3), 126-136.

Van Hecke, L., Loyen, A., Verloigne, M., Van der Ploeg, H. P., Lakerveld, J., Brug, J., De Bourdeaudhuij, I., Ekelund, U., Donnelly, A., Hendriksen, I., & Deforche, B. (2016). Variation in population levels of physical activity in European children and adolescents according to cross-European studies: a systematic literature review within DEDIPAC. *International Journal of Behavioral Nutrition and Physical Activity*, *13*(1), 1-22.

Vergeer, I., & Hanrahan, C. (1998). What modern dancers do to prepare: Content and objectives of preperformance routines. *AVANTE, 4,* 49-71.

Voltmer, E., Zander, M., Fischer, J. E., Kudielka, B. M., Richter, B., & Spahn, C. (2012). Physical and mental health of different types of orchestra musicians compared to other professions. *Medical Problems of Performing Artists*, *27*(1), 9-14.

Wasley, D., Taylor, A., Backx, K., & Williamon, A. (2012). Influence of fitness and physical activity on cardiovascular reactivity to musical performance. *Work*, *41*(1), 27-32.

Wasley, D., Williamon, A., & Taylor, A. (2011, August 24-27). An investigation into the acute effect of exercise on physiological and psychological responses to musical performance [Paper Presentation]. International Symposium on Performance Science, Toronto, Canada.

Weinberg, R. S. (1988). *The Mental Advantage*. Champagne, Ill: Leisure Press.

Wellington, J. (2015). *Educational research: Contemporary issues and practical approaches*. Bloomsbury Publishing.

Wergin, V. V., Beckmann, J., Gröpel, P., & Mesagno, C. (2020). Investigating cumulative effects of pre-performance routine interventions in beach volleyball serving. *PloS one*, *15*(1), e0228012.

Wesner, R. B., Noyes Jr, R., & Davis, T. L. (1990). The occurrence of performance anxiety among musicians. *Journal of Affective Disorders*, *18*(3), 177-185.

Westerdahl, E., Lindmark, B., Eriksson, T., Hedenstierna, G., & Tenling, A. (2005). Deep-breathing exercises reduce atelectasis and improve pulmonary function after coronary artery bypass surgery. *Chest*, *128*(5), 3482-3488.

Wetzel, C. (2006). *Surgical Stress Management Strategies.* Unpublished manuscript.

Wetzel, C. M., Kneebone, R. L., Woloshynowych, M., Nestel, D., Moorthy, K., Kidd, J., & Darzi, A. (2006). The effects of stress on surgical performance. *The American Journal of Surgery*, *191*(1), 5-10.

Wiese, J. (1983). Occipital and parietal alpha power before, during and after exercise. *Medicine and Science in Sports & Exercise*, *15*, 117.

Williamon, A. (2004). A guide to enhancing musical performance. In A. Williamon (Ed.), *Musical excellence: Strategies and techniques to enhance performance* (pp.3-18). Oxford University Press.

Williamon, A., Ginsborg, J., Perkins, R., & Waddell, G. (2021). *Performing Music Research: Methods in music education, psychology, and performance science*. Oxford University Press.

Williamon, A., Wasley, D., Burt-Perkins, R., Ginsborg, J., & Hildebrandt, W. (2009, December 15-18). Profiling musicians' health, wellbeing, and performance. [Paper Presentation]. International Symposium on Performance Science, Auckland, New Zealand.

Wilson, G.D. (1997). Performance Anxiety. In D.J. Hargreaves, & A.C. North (Eds.), *The Social Psychology of Music* (pp.229-245). Oxford: Oxford University Press.

Wilson, G. D. (2002). *Psychology for Performing Artists*. London: Whurr Publishers.

Wolfe, M. L. (1990). Coping with musical performance anxiety: Problem-focused and emotion-focused strategies. *Medical Problems of Performing Artists*, *5*(1), 33-36.

Wood, C. J., Barton, J., & Smyth, N. (2022). A cross-sectional study of physical activity behaviour and associations with wellbeing during the UK coronavirus lockdown. *Journal of Health Psychology*, *27*(6), 1432-1444.

World Health Organization [WHO], 2016. *World Health Statistics 2016: Monitoring Health for the SDGs Sustainable Development Goals*. World Health Organization.

World Health Organization [WHO], (2010). *Global Recommendations on Physical Activity for Health*. Geneva: World Health Organization.

Wrisberg, C. A., & Pein, R. C. (1992). The pre-shot interval and free throw shooting accuracy: An exploratory investigation. *The Sport Psychologist*, *6*, 14-23.

Wu, S. J. (2007). Occupational risk factors for musculoskeletal disorders in musicians: a systematic review. *Medical Problems of Performing Artists*, *22*, 43–52.

Yerkes, R. M., & Dodson, J. D. (1908). The relation of strength of stimulus to rapidity of habit-formation. *Journal of Comparative Neurology and Psychology*, *18*, 459–482 (1908). 10.1002/cne.920180503

Yoshie, M., Kudo, K., Murakoshi, T., & Ohtsuki, T. (2009). Music performance anxiety in skilled pianists: effects of social-evaluative performance situation on subjective, autonomic, and electromyographic reactions. *Experimental Brain Research*, *199*, 117-126.

Zammit, B.B. (2012). *Is music performance anxiety necessarily detrimental to performance quality?* Unpublished raw data for MSc essay. Royal College of Music, London.

Appendix 1

PRE-PERFORMANCE ROUTINES

Survey 1

You are being invited to take part in this research which looks at the pre-performance routines that musicians use. This study is part of a PhD research at the Royal College of Music.

On the following pages you will be asked a number of questions about pre-performance routines in different scenarios. The survey should take 20 minutes to complete.

This project has been reviewed by the CUK Research Ethics Committee (REC).

If you have any queries or concerns about the research, please feel free to contact me on berenice.zammit@rcm.ac.uk

1. Your participation in this research is voluntary, and you may stop answering the survey at any time. By submitting a completed survey, however, you are giving your informed consent to participate in this research. If you agree to these terms please click *YES* below or *NO* to exit this survey.

◯ Yes

◯ No

2. Sex

◯ Female

◯ Male

3. What is your age?

4. What is your main instrument?

5. For how long years have you been playing your main instrument?

Other (please specify)

6. Please select whether you are:

◯ An undergraduate musician

◯ A postgraduate musician

◯ A professional musician

7. Have you (or do you currently) play in large ensembles or orchestras?

In this survey, the Pre-Performance Period is the time in which you engage in task relevant thoughts and actions leading to a musical performance.

8. In the past year, how many performances in a typical large ensemble/orchestra have you given?

9. How long in advance do you consider the pre-performance period for a typical large ensemble/orchestra performance? (e.g. 5 minutes, 1 hour, half a day, a day, 3 days etc)

10. We are interested in what you do in the period prior to a typical large ensemble/orchestra performance. Please tick a single response for each item to indicate whether you increase these behaviours *PRIOR* to a typical large ensemble/orchestra performance.

	Often	Sometimes	Rarely	Never
1. Reading something distracting	☐	☐	☐	☐
2. Drinking alcohol	☐	☐	☐	☐
3. Thinking about other things to keep the mind off performance	☐	☐	☐	☐
4. Smoking cigarettes	☐	☐	☐	☐
5. Going out or meeting with friends	☐	☐	☐	☐
6. Taking sedatives (e.g. beta blockers)	☐	☐	☐	☐
7. Being alone	☐	☐	☐	☐
8. Meditating	☐	☐	☐	☐
9. Deep breath/relaxation exercises (including stretching)	☐	☐	☐	☐
10. Exercising (with continuous, rhythmic movements lasting at least 15 minutes, e.g. brisk walking at moderate intensity)	☐	☐	☐	☐
11. Going over notes/chords/passages/scores/words, which are not well prepared	☐	☐	☐	☐
12. Going over notes/chords/passages/scores/words, even though they are well prepared	☐	☐	☐	☐
13. Talking to your teacher/mentor about your performance	☐	☐	☐	☐
14. Talking to your co-performers about your performance	☐	☐	☐	☐

Please write any other activities that you do in the text box below and indicate whether you do these OFTEN, SOMETIMES or RARELY:

11. Below, provide a few words as to why you engage in the activities mentioned in Q.10 *PRIOR* to a typical large ensemble/orchestra performance. Skip through the activities that you *NEVER* do.

1. Reading something distracting

2. Drinking alcohol

3. Thinking about other things to keep the mind off performance

4. Smoking cigarettes

5. Going out or meeting with friends

6. Taking sedatives (e.g. beta blockers)

7. Being alone

8. Meditating

9. Deep breath/relaxation exercises (including stretching)

10. Exercising (with continuous, rhythmic movements lasting at least 15 minutes, e.g. brisk walking at moderate intensity)

11. Going over notes/chords/passages/scores/words which have not been well prepared

12. Going over notes/chords/passages/scores/words even though they have been well prepared

13. Other activity (name):

14. Other activity (name):

15. Other activity (name):

12. Please rate the items below according to how often you engage in these activities 2 hours *AFTER* a typical large ensemble/orchestra performance.

	Often	Sometimes	Rarely	Never
1. Reading something distracting to keep your mind off your lesson	☐	☐	☐	☐
2. Drinking alcohol	☐	☐	☐	☐
3. Thinking about other things to keep your mind off your lesson	☐	☐	☐	☐
4. Smoking cigarettes	☐	☐	☐	☐
5. Going out or meeting with friends	☐	☐	☐	☐
6. Taking sedatives (e.g. beta blockers)	☐	☐	☐	☐
7. Being alone	☐	☐	☐	☐
8. Meditating	☐	☐	☐	☐
9. Deep breath/relaxation exercises (including stretching)	☐	☐	☐	☐
10. Exercising (with continuous, rhythmic movements lasting at least 15 minutes, e.g. brisk walking at moderate intensity)	☐	☐	☐	☐
11. Going over notes/chords/passages/scores/words that were not performed well	☐	☐	☐	☐
12. Going over notes/chords/passages/scores/words even though they were performed well	☐	☐	☐	☐
13. Talking to your teacher/mentor about your performance	☐	☐	☐	☐
14. Talking to your co-performers about your performance	☐	☐	☐	☐
15. Talking to your audience about your performance	☐	☐	☐	☐

Please write any other activities that you do in the text box below and indicate whether you do these OFTEN, SOMETIMES or RARELY.

13. Below, provide a few words as to why you engage in the activities mentioned in *AFTER* a typical large ensemble/orchestra performance. Skip through the activities that you *NEVER* do.

1. Reading something distracting

2. Drinking alcohol

3. Thinking about other things to keep the mind off performance

4. Smoking cigarettes

5. Going out or meeting with friends

6. Taking sedatives (e.g. beta blockers)

7. Being alone

8. Meditating

9. Deep breath/relaxation exercises (including stretching)

10. Exercising (with continuous, rhythmic movements lasting at least 15 minutes, e.g. brisk walking at moderate intensity)

11. Going over notes/chords/passages/scores/words which have not been well prepared

12. Going over notes/chords/passages/scores/words even though they have been well prepared

13. Other activity (name):

14. Other activity (name):

15. Other activity (name):

14. Have you (or do you currently) play in chamber groups?

In this survey, the Pre-Performance Period is the time in which you engage in task relevant thoughts and actions leading to a musical performance.

15. In the past year, how many performances in a typical chamber group have you given?

16. How long in advance do you consider the pre-performance period for a typical chamber group performance? (e.g. 5 minutes, 1 hour, half a day, a day, 3 days etc)

17. We are interested in what you prior to a typical chamber group performance. Please tick a single response for each item to indicate whether you increase these behaviours *PRIOR* to a typical chamber group performance.

	Often	Sometimes	Rarely	Never
1. Reading something distracting	☐	☐	☐	☐
2. Drinking alcohol	☐	☐	☐	☐
3. Thinking about other things to keep the mind off performance	☐	☐	☐	☐
4. Smoking cigarettes	☐	☐	☐	☐
5. Going out or meeting with friends	☐	☐	☐	☐
6. Taking sedatives (e.g. beta blockers)	☐	☐	☐	☐
7. Being alone	☐	☐	☐	☐
8. Meditating	☐	☐	☐	☐
9. Deep breath/relaxation exercises (including stretching)	☐	☐	☐	☐
10. Exercising (with continuous, rhythmic movements lasting at least 15 minutes, e.g. brisk walking at moderate intensity)	☐	☐	☐	☐
11. Going over notes/chords/passages/scores/words, which are not well prepared	☐	☐	☐	☐
12. Going over notes/chords/passages/scores/words, even though they are well prepared	☐	☐	☐	☐
13. Talking to your teacher/mentor about your performance	☐	☐	☐	☐
14. Talking to your co-performers about your performance	☐	☐	☐	☐

Please write any other activities that you do in the text box below and indicate whether you do these OFTEN, SOMETIMES or RARELY.

18. Below, provide a few words as to why you engage in the activities mentioned in *PRIOR* to a typical chamber group performance. Skip through the activities that you *NEVER* do.

1. Reading something distracting

2. Drinking alcohol

3. Thinking about other things to keep the mind off performance

4. Smoking cigarettes

5. Going out or meeting with friends

6. Taking sedatives (e.g. beta blockers)

7. Being alone

8. Meditating

9. Deep breath/relaxation exercises (including stretching)

10. Exercising (with continuous, rhythmic movements lasting at least 15 minutes, e.g. brisk walking at moderate intensity)

11. Going over notes/chords/passages/scores/words which have not been well prepared

12. Going over notes/chords/passages/scores/words even though they have been well prepared

13. Other activity (name):

14. Other activity (name):

15. Other activity (name):

19. Please rate the items below according to how often you engage in these activities 2 hours *AFTER* a typical chamber group performance.

	Often	Sometimes	Rarely	Never
1. Reading something distracting to keep your mind off your lesson	☐	☐	☐	☐
2. Drinking alcohol	☐	☐	☐	☐
3. Thinking about other things to keep your mind off your lesson	☐	☐	☐	☐
4. Smoking cigarettes	☐	☐	☐	☐
5. Going out or meeting with friends	☐	☐	☐	☐
6. Taking sedatives (e.g. beta blockers)	☐	☐	☐	☐
7. Being alone	☐	☐	☐	☐
8. Meditating	☐	☐	☐	☐
9. Deep breath/relaxation exercises (including stretching)	☐	☐	☐	☐
10. Exercising (with continuous, rhythmic movements lasting at least 15 minutes, e.g. brisk walking at moderate intensity)	☐	☐	☐	☐
11. Going over notes/chords/passages/scores/words that were not performed well	☐	☐	☐	☐
12. Going over notes/chords/passages/scores/words even though they were performed well	☐	☐	☐	☐
13. Talking to your teacher/mentor about your performance	☐	☐	☐	☐
14. Talking to your co-performers about your performance	☐	☐	☐	☐
15. Talking to your audience about your performance	☐	☐	☐	☐

Please write any other activities that you do in the text box below and indicate whether you do

these OFTEN, SOMETIMES or RARELY.

20. Below, provide a few words as to why you engage in the activities mentioned in *AFTER* a typical chamber group performance. Skip through the activities that you *NEVER* do.

1. Reading something distracting

2. Drinking alcohol

3. Thinking about other things to keep the mind off performance

4. Smoking cigarettes

5. Going out or meeting with friends

6. Taking sedatives (e.g. beta blockers)

7. Being alone

8. Meditating

9. Deep breath/relaxation exercises (including stretching)

10. Exercising (with continuous, rhythmic movements lasting at least 15 minutes, e.g. brisk walking at moderate intensity)

11. Going over notes/chords/passages/scores/words which have not been well prepared

12. Going over notes/chords/passages/scores/words even though they have been well prepared

13. Other activity (name):

14. Other activity (name):

15. Other activity (name):

21. Have you (or do you currently) play as a soloist in recitals?

In this survey, the Pre-Performance Period is the time in which you engage in task relevant thoughts and actions leading to a musical performance.

22. In the past year, how many solo performances have you given?

23. How long in advance do you consider the pre-performance period for a typical solo recital? (e.g. 5 minutes, 1 hour, half a day, a day, 3 days etc)

24. We are interested in what you do prior to a typical solo recital. Please tick a single response for each item to indicate whether you increase these behaviours *PRIOR* to a typical solo recital.

	Often	Sometimes	Rarely	Never
1. Reading something distracting	☐	☐	☐	☐
2. Drinking alcohol	☐	☐	☐	☐
3. Thinking about other things to keep the mind off performance	☐	☐	☐	☐
4. Smoking cigarettes	☐	☐	☐	☐
5. Going out or meeting with friends	☐	☐	☐	☐
6. Taking sedatives (e.g. beta blockers)	☐	☐	☐	☐
7. Being alone	☐	☐	☐	☐
8. Meditating	☐	☐	☐	☐
9. Deep breath/relaxation exercises (including stretching)	☐	☐	☐	☐
10. Exercising (with continuous, rhythmic movements lasting at least 15 minutes, e.g. brisk walking at moderate intensity)	☐	☐	☐	☐
11. Going over notes/chords/passages/scores/words, which are not well prepared	☐	☐	☐	☐
12. Going over notes/chords/passages/scores/words, even though they are well prepared	☐	☐	☐	☐
13. Talking to your teacher/mentor about your performance	☐	☐	☐	☐
14. Talking to your co-performers about your performance	☐	☐	☐	☐

Please write any other activities that you do in the text box below and indicate whether you do these OFTEN, SOMETIMES or RARELY.

25. Below, provide a few words as to why you engage in the activities mentioned in Q.24 *PRIOR* to a typical solo recital. Skip through the activities that you *NEVER* do.

1. Reading something distracting

2. Drinking alcohol

3. Thinking about other things to keep the mind off performance

4. Smoking cigarettes

5. Going out or meeting with friends

6. Taking sedatives (e.g. beta blockers)

7. Being alone

8. Meditating

9. Deep breath/relaxation exercises (including stretching)

10. Exercising (with continuous, rhythmic movements lasting at least 15 minutes, e.g. brisk walking at moderate intensity)

11. Going over notes/chords/passages/scores/words which have not been well prepared

12. Going over notes/chords/passages/scores/words even though they have been well prepared

13. Other activity (name):

14. Other activity (name):

15. Other activity (name):

26. Please rate the items below according to how often you engage in these activities 2 hours *AFTER* a typical solo recital.

	Often	Sometimes	Rarely	Never
1. Reading something distracting to keep your mind off your lesson	☐	☐	☐	☐
2. Drinking alcohol	☐	☐	☐	☐
3. Thinking about other things to keep your mind off your lesson	☐	☐	☐	☐
4. Smoking cigarettes	☐	☐	☐	☐
5. Going out or meeting with friends	☐	☐	☐	☐
6. Taking sedatives (e.g. beta blockers)	☐	☐	☐	☐
7. Being alone	☐	☐	☐	☐
8. Meditating	☐	☐	☐	☐
9. Deep breath/relaxation exercises (including stretching)	☐	☐	☐	☐
10. Exercising (with continuous, rhythmic movements lasting at least 15 minutes, e.g. brisk walking at moderate intensity)	☐	☐	☐	☐
11. Going over notes/chords/passages/scores/words that were not performed well	☐	☐	☐	☐
12. Going over notes/chords/passages/scores/words even though they were performed well	☐	☐	☐	☐
13. Talking to your teacher/mentor about your performance	☐	☐	☐	☐
14. Talking to your co-performers about your performance	☐	☐	☐	☐
15. Talking to your audience about your performance	☐	☐	☐	☐

Please write any other activities that you do in the text box below and indicate whether you do

these OFTEN, SOMETIMES or RARELY:

27. Below, provide a few words as to why you engage in the activities mentioned *AFTER* a typical solo recital. Skip through the activities that you *NEVER* do.

1. Reading something distracting

2. Drinking alcohol

3. Thinking about other things to keep the mind off performance

4. Smoking cigarettes

5. Going out or meeting with friends

6. Taking sedatives (e.g. beta blockers)

7. Being alone

8. Meditating

9. Deep breath/relaxation exercises (including stretching)

10. Exercising (with continuous, rhythmic movements lasting at least 15 minutes, e.g. brisk walking at moderate intensity)

11. Going over notes/chords/passages/scores/words which have not been well prepared

12. Going over notes/chords/passages/scores/words even though they have been well prepared

13. Other activity (name):

14. Other activity (name):

15. Other activity (name):

28. Have you, or do you currently audition/play in competitions?

In this survey, the Pre-Performance Period is the time in which you engage in task relevant thoughts and actions leading to a musical performance.

29. In the past year, how many auditions/competitions have you played in?

30. How long in advance do you consider the pre-performance period for a typical audition/competition? (e.g. 5 minutes, 1 hour, half a day, a day, 3 days etc)

31. We are interested in what you do prior to a typical audition. Please tick a single response for each item to indicate whether you increase these behaviours *PRIOR* to a typical audition.

	Often	Sometimes	Rarely	Never
1. Reading something distracting	☐	☐	☐	☐
2. Drinking alcohol	☐	☐	☐	☐
3. Thinking about other things to keep the mind off performance	☐	☐	☐	☐
4. Smoking cigarettes	☐	☐	☐	☐
5. Going out or meeting with friends	☐	☐	☐	☐
6. Taking sedatives (e.g. beta blockers)	☐	☐	☐	☐
7. Being alone	☐	☐	☐	☐
8. Meditating	☐	☐	☐	☐
9. Deep breath/relaxation exercises (including stretching)	☐	☐	☐	☐
10. Exercising (with continuous, rhythmic movements lasting at least 15 minutes, e.g. brisk walking at moderate intensity)	☐	☐	☐	☐
11. Going over notes/chords/passages/scores/words, which are not well prepared	☐	☐	☐	☐
12. Going over notes/chords/passages/scores/words, even though they are well prepared	☐	☐	☐	☐
13. Talking to your teacher/mentor about your performance	☐	☐	☐	☐
14. Talking to your co-performers about your performance	☐	☐	☐	☐

Please write any other activities that you do in the text box below and indicate whether you do these OFTEN, SOMETIMES or RARELY.

32. Below, provide a few words as to why you engage in the activities mentioned in *PRIOR* to a typical audition. Skip through the activities that you *NEVER* do.

1. Reading something distracting

2. Drinking alcohol

3. Thinking about other things to keep the mind off performance

4. Smoking cigarettes

5. Going out or meeting with friends

6. Taking sedatives (e.g. beta blockers)

7. Being alone

8. Meditating

9. Deep breath/relaxation exercises (including stretching)

10. Exercising (with continuous, rhythmic movements lasting at least 15 minutes, e.g. brisk walking at moderate intensity)

11. Going over notes/chords/passages/scores/words which have not been well prepared

12. Going over notes/chords/passages/scores/words even though they have been well prepared

13. Other activity (name):

14. Other activity (name):

15. Other activity (name):

33. Please rate the items below according to how often you engage in these activities 2 hours *AFTER* a typical audition/competition.

	Often	Sometimes	Rarely	Never
1. Reading something distracting to keep your mind off your lesson	☐	☐	☐	☐
2. Drinking alcohol	☐	☐	☐	☐
3. Thinking about other things to keep your mind off your lesson	☐	☐	☐	☐
4. Smoking cigarettes	☐	☐	☐	☐
5. Going out or meeting with friends	☐	☐	☐	☐
6. Taking sedatives (e.g. beta blockers)	☐	☐	☐	☐
7. Being alone	☐	☐	☐	☐
8. Meditating	☐	☐	☐	☐
9. Deep breath/relaxation exercises (including stretching)	☐	☐	☐	☐
10. Exercising (with continuous, rhythmic movements lasting at least 15 minutes, e.g. brisk walking at moderate intensity)	☐	☐	☐	☐
11. Going over notes/chords/passages/scores/words that were not performed well	☐	☐	☐	☐
12. Going over notes/chords/passages/scores/words even though they were performed well	☐	☐	☐	☐
13. Talking to your teacher/mentor about your performance	☐	☐	☐	☐
14. Talking to your co-performers about your performance	☐	☐	☐	☐
15. Talking to your audience about your performance	☐	☐	☐	☐

Please write any other activities that you do in the text box below and indicate whether you do these OFTEN, SOMETIMES or RARELY.

34. Below, provide a few words as to why you engage in the activities mentioned in *AFTER* a typical audition/competition. Skip through the activities that you *NEVER* do.

1. Reading something distracting

2. Drinking alcohol

3. Thinking about other things to keep the mind off performance

4. Smoking cigarettes

5. Going out or meeting with friends

6. Taking sedatives (e.g. beta blockers)

7. Being alone

8. Meditating

9. Deep breath/relaxation exercises (including stretching)

10. Exercising (with continuous, rhythmic movements lasting at least 15 minutes, e.g. brisk walking at moderate intensity)

11. Going over notes/chords/passages/scores/words which have not been well prepared

12. Going over notes/chords/passages/scores/words even though they have been well prepared

13. Other activity (name):

14. Other activity (name):

15. Other activity (name):

Thank you for your time!

If you would like to know more about this research, please feel free to contact me on berenice.zammit@rcm.ac.uk Alternatively, you may wish to contact my leading supervisor Aaron Williamon on aaron.williamon@rcm.ac.uk

35. If you are interested in participating further in this research project please leave your email address here:

Email Address

Appendix 2

Participant Information Sheet and Participant Consent Form

Title
Pre-Performance Routines in Professional Musicians

Date: 26th November 2019

Invitation
You are being invited to take part in my research project. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask me if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. You will be given this information sheet to keep. Thank you for reading this.

Project
Pre-performance routines (PPRs) have been consistently regarded as determining the likelihood of effective performance. However, most of the available studies on PPRs have been conducted in the field of sports and there is relatively little information on how PPRs can help achieve a positive performance in music. This research therefore tries to find out which PPRs professional classical musicians adopt prior to performance and what the function of these PPRs are.

The present interview study is seeking to build upon findings from an earlier survey study by exploring in greater detail some of the pre-performance routines undertaken by professional classical musicians. This research will also examine the reasons behind these behaviours. These interviews will not be longer than an hour. These interviews will also be audio-recorded. You can refuse consent to be recorded, and for the recordings to be played when I come to report the research.

Characteristics of participants
Approximately 15 professional classical musicians will be recruited for this study. An equal number of male and female participants will be sought. An equal number of string and winds/brass players, as well as those in the 25-44 years and the 45+ years age groups will be sought. Participants will be selected if they are permanent full-time professional orchestral musicians or soloists.

Voluntary participation
It is up to you to decide if you want to take part in my project or not. If you don't want to take part, or you change your mind about taking part, having agreed to do so, you won't be penalized in any way. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to withdraw at any time, without giving any reason. You can withdraw either by physically leaving and/or by withdrawing consent for me to use whatever contribution you have already made to the research. Again, you won't be penalized in any way.

Nature of participation
Your participation in this project will be a one-time event. Each interview session will last approximately an hour and will be audio-recorded and transcribed. Interviews will be conducted face to face were possible, or over skype. The date, time and place for interview will be discussed with you according to your availability. Interviews will take place during January through August 2020.

Lifestyle restrictions
You are *not* likely to experience any lifestyle restrictions as a result of taking part in this project.

Potential risks to participants
While we do not foresee any possible risks from taking part in this research, it is possible that you will experience discomfort or anxiety related to issues that may be discussed during the course of the interview. Should this occur, you will be provided with appropriate helplines to receive further support.

Potential benefits to participants

While people taking part in my project are unlikely to experience any personal benefits as a result, I hope my research will bring to light what pre-performance routines professional classical orchestral musicians adopt so as to be able to extend this knowledge to music students in conservatoires.

Possible termination of research
If this project has to be terminated for any reason, you and/or the contribution you have made are no longer required for this research, you will be informed and given the reason why.

Confidentiality and anonymity
Information that is collected about you, for the purposes of the research, will be kept strictly confidential unless you disclose risk or harm to yourself or others. Information you provide will only be attributed to you by name with your explicit permission.

Storing personal data and information
Your personal data and any information that you provide for the purposes of this research will be stored securely for 10 years. If I wish to re-use it within this time period, I will seek your permission to do so. At the end of the period, it will be destroyed.

Outputs
The contribution that you make to this project will be mainly used for my PhD thesis. The results may also be used in conference presentations, reports and journal articles.

Ethical approval
Representatives of the CUK Research Ethics Committee (REC) have reviewed this project and granted ethical approval for it to be carried out.

Helpline
Samaritans (24 hours a day)

www.samaritans.org
08457 909090
Samaritans is a registered charity aimed at providing emotional support to anyone in emotional distress, struggling to cope, or at risk of suicide throughout the United Kingdom and Ireland.

Contact details
Berenice Beverley Zammit,
Royal College of Music
Berenice.zammit@rcm.ac.uk

Head of Department:
Aaron Williamon,
Royal College of Music
Aaron.williamon@rcm.ac.uk

Thank you for reading this and for taking part in the project!

Participant Consent Form

Title of project: Pre-Performance Routines in Professional Musicians
Name of researcher: Berenice Beverley Zammit
Participant identification code for this project:

1. I confirm that I have read and understood the participant information sheet dated 26 November, 2019, for research project in which I have been asked to take part and have had the opportunity to ask questions.

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason.

3. I give the researcher(s) permission to collect information about me and from me for the purposes of the research project provided all information about me will be kept confidential, stored securely and destroyed after 10 years.

4. I DO/ DO NOT [delete as appropriate] give permission for information provided by me to be attributed to me by name.

5. I DO/ DO NOT [delete as appropriate] give permission for my interview to be audio-recorded.

6. I DO/ DO NOT [delete as appropriate] give permission for audio-recordings of me to be played in the course of reporting the research.

7. I agree to take part in the above-named project.

Name of participant	**Date**	**Signature**
Name of person taking consent *(if different from lead researcher)*	**Date**	**Signature**
Researcher	**Date**	**Signature**

Interview Schedule

Interview will take around an hour

Introduction

- Introduce myself
- Explain study

Warm-up

- Age
- Principle Instrument
- Main current professional activity
- Other professional activities

Think of an optimal performance you have had over the years as a professional classical musician.

- Can you describe this event?
- Can you describe how you felt at the time?

I will focus on how you felt mentally and physically before and after this performance and I will refer to this as the mental and the physical state.

- What was your mental state like before/during this optimal performance?
- What was your physical state like before/during this optimal performance?

Is this mental state something you always try to achieve before/during performance?

- Do you think that this particular mental state helps you perform better? Why?
- If you are not able to achieve this particular mental state, what conclusions can you draw to achieve this mental state more often?

Is this physical state something you always try to achieve before/during performance?

- Do you think that this particular physical state helps you perform better? Why?
- If you are not able to achieve this particular physical state, what conclusions can you draw to achieve this physical state more often?

- What pre-performance routines do you engage in to help you achieve this mental state prior/during to performance?

- What pre-performance routines do you engage in to help you achieve this physical state prior/during performance?

- How closely aligned would you say your physical and mental states were before/during this optimal performance?

- We just talked about this optimal performance. How often do you get to have optimal performances? Is it very often or is it rare?

When did your pre-performance period start?
- When did the feeling of readying for performance kick in?
- Can you think back about when your pre-performance period started?

At what stage of musical preparation were you prior to this performance?
- Had you just learnt the piece or was it already in your repertoire?
- Had you arrived at the same stage as regarding piece structure, technique, and interpretation?

- How did you go about achieving this musical preparation (structure, basic technique, interpretation) before performance?

Think of a bad performance you have had over the years as a professional classical musician.

- Can you describe this event?
- Can you describe how you felt at the time?

I will focus on how you felt mentally and physically before and after this performance and I will refer to this as the mental and the physical state.

- What was your mental state like before/during this bad performance?
- What was your physical state like before/during this bad performance?

Is this mental state something you always try to achieve before/during performance?
- Do you think that this particular mental state helps you perform better? Why?
- If you are not able to achieve this particular mental state, what conclusions can you draw to achieve this mental state more often?

Is this physical state something you always try to achieve before/during performance?
- Do you think that this particular physical state helps you perform better? Why?
- If you are not able to achieve this particular physical state, what conclusions can you draw to achieve this physical state more often?

- What pre-performance routines do you engage in to help you achieve this mental state prior/during to performance?

- What pre-performance routines do you engage in to help you achieve this physical state prior/during performance?

- How closely aligned would you say your physical and mental states were before/during this bad performance?

- We just talked about this optimal performance. How often or rare is it that you get to have optimal performances?

When did your pre-performance period start?

- When did the feeling of readying for performance kick in?
- Can you think back about when your pre performance period started?

At what stage of musical preparation were you prior to this performance?

- Had you just learnt the piece or was it already in your repertoire?
- Had you arrived at the same stage as regarding piece structure, technique, and interpretation?

- How did you go about achieving this musical preparation (structure, basic technique, interpretation) before performance?

- Do you reflect upon the usefulness of the strategies you have adopted for the optimal performance versus the bad performance?

- A number of participants in the survey seem to spend time alone prior to performance. Do you find yourself doing the same?
- Did you spend time alone prior to your optimal/bad performance?
- When do you start looking to spend time alone prior to performance?
- What do you do while you are alone prior to performance?
- What do you try to achieve by spending time alone prior to performance?
- Do you think that spending time alone helps you perform better?

- Is there anything else that you do prior to performance that you would like to comment about?

I am looking to investigate how one prepares for performance. Is doing deliberate exercise something that you have considered?

Can you imagine a connection between physical exercise and your musical performance?

- Do you engage in physical activity before/after performance? Why or why not?

- How does being physically fit effect you as a musician?

- In what ways, if at all, do you reflect upon the usefulness of the strategies you have adopted for performance?

Thank you very much for your time. Your input has been invaluable!

Interview Sample 1

[*This has been redacted in the digitised version*]

Interview Sample 2

[*This has been redacted in the digitised version*]

Appendix 3

FIT MUSICIAN

Survey 2

On this page you will be provided with a description of the study and informed of how we will use the data. When you click NEXT at the bottom of each page you are giving your consent for your data to be used in this research.

Title of research
Optimizing Performance: Pre-performance routines in professional classical instrumentalists.

Description of study
Thank you for considering taking part in my research project, undertaken as part of my PhD at the Royal College of Music (RCM), UK, under the supervision of Professor Aaron Williamon and Dr Terry Clark. Pre-performance routines (PPRs) have been consistently regarded as determining the likelihood of effective performance. However, most of the available studies on PPRs have been conducted in the field of sports and there is relatively little information on how PPRs can help achieve a positive performance in music. My research therefore seeks to find out which PPRs professional classical instrumentalists adopt prior to performance, what the function of these PPRs are, and what other PPRs one might adopt for performance.

The present survey seeks to build upon the findings from my earlier studies that explored musicians' use of pre-performance routines and the reasons behind their use of those routines. The present survey aims to find out whether professional classical instrumentalists perform physical exercise for general health purposes as well as a pre-performance routine, and what their perceived level of physical fitness is. It also seeks to explore the effects of physical exercise on general health, well-being and social connectedness. The survey looks into how pre-performance routines and the use of physical exercise might have changed as a result of COVID-19. The survey is divided into 5 sections: About You, Health and Well-being, Physical Activity, Physical Exercise and Performance, and Social Connectedness, and it should take approximately 20 minutes to complete.

Why have you been chosen?
We have asked you to respond to my questionnaire because you are a classical performing instrumentalist whose main source of income is primarily derived from work in the following scenarios: postgraduate student in performance practice, professional orchestral musician, professional chamber or duo musician, professional freelance musician (portfolio career).

Informed consent
Your participation in this research is voluntary, and you may withdraw from the study at any time if you wish. By submitting a completed questionnaire, however, you are giving your informed consent to participate in my study.

What will we do with your data?
The data you provide will be anonymous (separated from your name) and confidential (not disclosed to anyone else). We may publish reports based on my findings, but you will not be identifiable from the data included.

Whether or not you choose to withdraw from the study, the data themselves will be stored securely as follows: on a password-protected computer for 10 years. If we wish to re-use your data within this time period, we will seek your permission to do so. At the end of the period your data will be destroyed.
This project has been reviewed and approved by the CUK Research Ethics Committee.
If you agree to these terms please click YES below or NO to exit this survey.

◯ Yes (1)

◯ No (2)

Q0.1 You have been chosen to take this survey because you are a classical performing **instrumentalist (not a singer)** whose main source of income is ***primarily*** derived from work in the following scenarios: professional orchestral musician, professional chamber or duo musician, professional freelance musician (portfolio career), postgraduate student in performance practice. Please confirm this is the case by either clicking YES, I CONFIRM or NO, I CANNOT CONFIRM below.

◯ Yes, I confirm (1)

◯ No, I cannot confirm (2)

Q1.1 **1. About you**

Do you identify as

◯ female (1)

◯ male (2)

◯ would rather not say (3)

◯ other (please define) (4) ____

Q1.2 How old are you?

____

Q1.3 Which is your primary instrument?

____

Q1.4 In which of the following do you work primarily?
*By **primarily** we mean that the most part, or all, of your livelihood comes from work in one of the below scenarios.*

◯ Professional orchestral musician (2)

◯ Professional chamber/duo musician (3)

◯ Professional freelance musician (portfolio career) (4)

◯ Postgraduate student in performance practice (1)

Q1.5 When answering the following 4 questions, please answer according to your lifestyle **prior** to the COVID-19 pandemic.

How much time per day did you usually spend practicing alone?

◯ hours per day (OR answer in minutes below) (15) ____

◯ minutes per day (OR answer in hours above) (16) ____

Q1.6 How much time per day did you usually spend rehearsing in ensembles?

◯ hours per day (OR answer in minutes below) (4) ____

◯ minutes per day (OR answer in hours above) (5) ____

◯ not applicable (7)

Q1.7 How many auditions did you used to prepare for in a typical year?

◯ Number of auditions in a year (4) ____

◯ Not applicable (5)

Q1.8 How many performances (orchestral or chamber/duo or solo or other) did you typically give in a year?

Q1.9 When answering the following 8 questions, please answer according to your lifestyle prior to the COVID-19 pandemic.

How many years have you been working as a **professional** orchestral player?

____

Q1.10 What position do you play in?

- ◯ Leader (Concert Master) (1)
- ◯ Co-Leader (Associate Concert Master) (2)
- ◯ Assistant Concert Master (3)
- ◯ Principal (4)
- ◯ Co-Principal (Associate Principal) (5)
- ◯ Sub-Principal (Assistant Principal) (6)
- ◯ Section Player (7)

Q1.11 What type of professional orchestra do you play in?

- ◯ Pit orchestra (ballet, opera, music theater) (1)
- ◯ Symphony / philharmonic orchestra (2)
- ◯ String / Chamber orchestra (not small chamber ensembles) (3)

Q1.12 How much time per day did you usually spend practicing alone?

- ◯ hours per day (OR answer in minutes below) (4) ____
- ◯ minutes per day (OR answer in hours above) (5) ____

Q1.13 How much time per day did you usually spend rehearsing with your orchestra?

- ◯ hours per day (OR answer in minutes below) (4) ____
- ◯ minutes per day (OR answer in hours above) (5) ____

Q1.14 How many performances as an orchestral musician did you typically give in a year?

____

Q1.15 How many times a month did you usually perform the same programme in this orchestral setting?

____

Q1.16 How long does a typical performance in your orchestral setting last?

○ hours per day (OR answer in minutes below) (4)
____

○ minutes per day (OR answer in hours above) (5)
____

Q1.17

When answering the following 4 questions, please answer according to your lifestyle prior to the Covid-19 pandemic.
How many years have you been playing as a **professional** full-time chamber/duo musician?

____

Q1.18 How much time per day did you usually spend practicing alone?

○ hours per day (OR answer in minutes below) (4)
____

○ minutes per day (OR answer in hours above) (5)
____

Q1.19 How much time per day did you usually spend rehearsing with your ensemble?

○ hours per day (OR answer in minutes below) (4)
____

○ minutes per day (OR answer in hours above) (5)
____

Q1.20 How many performances as a chamber/duo musician did you typically give in a year?

____

Q1.21 When answering the following 9 questions, please answer according to your lifestyle prior to the Covid-19 pandemic.

How many years have you spent as a **professional** freelance musician?

____

Q1.22 How much time per day did you usually spend practicing alone?

○ hours per day (OR answer in minutes below) (4) ____

○ minutes per day (OR answer in hours above) (5) ____

Q1.23 How much time per day did you usually spend rehearsing with various ensembles?

○ hours per day (OR answer in minutes below) (4) ____

○ minutes per day (OR answer in hours above) (5) ____

○ not applicable (7)

Q1.24 Were you / are you currently looking for a full-time post as a **professional** musician?

○ Yes (1)

○ No (2)

○ Not applicable (4)

Q1.25 Are you currently preparing for auditions?

○ Yes (1)

○ No (2)

○ Not applicable (3)

Q1.26 How many auditions did you prepare for in a typical year?

○ Number of auditions in a year (4) ____

○ Not applicable (5)

Q1.27 Were you / are you currently on trial for a position as a full-time orchestral musician?

○ Yes (1)

○ No (2)

○ Not applicable (3)

Q1.28 How many orchestral or chamber/duo performances, or gigs, did you typically give in a year?

____

Q1.29 How many solo performances did you typically give in a year?

○ Number of solo performances in a year (4) ____

○ Not applicable (5)

Q2.1 2. Health and Wellbeing

We now have some questions we would like you to answer on your wellbeing. Please answer the following questions about how you have been feeling during the **past month**.

Please tick the box that best represents how often you have experienced or felt the following

	Never (1)	Once or twice (2)	About once a week (3)	About 2 or 3 times a week (4)	Almost every day (5)	Every day (6)
happy (1)	○	○	○	○	○	○
interested in life (2)	○	○	○	○	○	○
satisfied with life (3)	○	○	○	○	○	○
that you had something important to contribute to society (4)	○	○	○	○	○	○
that you belonged to a community (like a social group, or your neighbourhood) (5)	○	○	○	○	○	○
that your society is a good place, or is becoming a better place, for all people (6)	○	○	○	○	○	○
that people are basically good (7)	○	○	○	○	○	○
that the way our society works makes sense to you (8)	○	○	○	○	○	○
that you liked most parts of your personality (9)	○	○	○	○	○	○

good at managing the responsibilities of your daily life (10)	○	○	○	○	○	○
that you had warm and trusting relationships with others (11)	○	○	○	○	○	○
that you had experiences that challenged you to grow and become a better person (12)	○	○	○	○	○	○
confident to think or express your own ideas and opinions (13)	○	○	○	○	○	○
that your life has a sense of direction or meaning to it (14)	○	○	○	○	○	○

Q2.2 Please tell us if each of the following was true for you much of the time **during the past week**:

	Yes (1)	No (2)
...have you felt depressed? (1)	○	○
...have you felt that everything you did was an effort? (2)	○	○
...your sleep was restless? (3)	○	○
...you were happy? (4)	○	○
...you felt lonely (5)	○	○
...you enjoyed life? (6)	○	○
...you felt sad? (7)	○	○
...you could not get going? (8)	○	○

Q2.3 **We now have some questions we would like you to answer on your general health.**

How is your health in general?

○ Very good (1)

○ Good (2)

○ Fair (3)

○ Bad (4)

○ Very bad (5)

○ Would rather not say (6)

Q2.4 Do you have any ongoing (chronic) health issues?

- ◯ Yes (1)
- ◯ No (2)

Q2.4.1 Do you consider yourself as someone living with...? Please tick all that apply.

- ▢ Mental health issues (1)
- ▢ Cancer (2)
- ▢ Cardiovascular disease (3)
- ▢ Chronic pain (4)
- ▢ Chronic respiratory diseases (5)
- ▢ Yes, other (please specify) (6) ____
- ▢ Would rather not say (7)

Q3.1 **3. Physical Activity in the <u>last 7 days</u>**

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **<u>last 7 days.</u>** Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you did in the **last 7 days. Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

During the **last 7 days,** on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

○ days per week (1) ____

○ No vigorous physical activities (2)

Q3.1.1 How much time did you usually spend doing **vigorous** physical activities on one of those days?

○ hours per day (OR answer in minutes below) (1)
____

○ minutes per day (OR answer in hours above) (2)
____

○ Don't know / Not sure (3)

Q3.2 Think about all the **moderate** activities that you did in the **last 7 days. Moderate** physical activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

During the **last 7 days,** on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

○ days per week (1) ____

○ No moderate physical activities (2)

Q3.2.1 How much time did you usually spend doing **moderate** physical activities on one of those days?

○ hours per day (OR answer in minutes below) (1)
____

○ minutes per day (OR answer in hours above) (2)
____

○ Don't know / Not sure (3)

Q3.3 Think about the time you spent **walking** in the **last 7 days.** This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise and leisure.

During the last 7 days, on how many days did you **walk** for at least 10 minutes at a time?

- ○ days per week (1) ____

- ○ No walking (2)

Q3.3.1 How much time did you usually spend **walking** on one of those days?

- ○ hours per day (OR answer in minutes below) (1) ____

- ○ minutes per day (OR answer in hours above) (2) ____

- ○ Don't know / Not sure (3)

Q3.4 This question is about the time you spent **sitting** on weekdays in the **last 7 days.** Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

During the **last 7 days,** how much time did you spend **sitting** on a **weekday**?

- ○ hours per day (OR answer in minutes below) (1) ____

- ○ minutes per day (OR answer in hours above) (2) ____

- ○ Don't know / Not sure (3)

Q3.5
Physical Activity in a <u>typical 7-day period pre-COVID 19</u>
We will now ask you about the time you spent physically active in a **typical 7-day period pre-COVID-19.** Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the vigorous activities that you did in a **typical 7-day period pre-COVID-19**. Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

During a **typical 7-day period pre-COVID-19**, on how many days did you usually do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling?

◯ days per week (1) ____

◯ No vigorous physical activities (2)

Q3.5.1 How much time did you usually spend doing **vigorous** physical activity on one of those days?

◯ hours per day (OR answer in minutes below) (1)

____

◯ minutes per day (OR answer in hours above) (2)

____

◯ Don't know / Not sure (3)

Q3.6 Think about all the **moderate** activities that you did in a typical 7-day period pre-COVID-19. Moderate physical activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

During a typical 7-day period pre-COVID-19, on how many days did you usually do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

◯ days per week (1) ____

◯ No moderate physical activities (2)

Q3.6.1 How much time did you usually spend doing **moderate** physical activities on one of those days?

◯ hours per day (OR answer in minutes below) (1)

____

◯ minutes per day (OR answer in hours above) (2)

____

◯ Don't know / Not sure (3)

Q3.7 Think about the time you spent walking in a typical 7-day period pre-COVID-19. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise and leisure.

During a typical 7-day period pre-COVID-19, on how many days did you usually walk for at least 10 minutes at a time?

◯ days per week (1) ____

◯ No walking (2)

Q3.7.1 How much time did you usually spend walking on one of those days?

◯ hours per day (OR answer in minutes below) (1) ____

◯ minutes per day (OR answer in hours above) (2) ____

◯ Don't know / Not sure (3)

Q3.8 This question is about the time you spent sitting on weekdays in a typical 7-day period pre-COVID-19. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

During a typical 7-day period pre-COVID-19, how much time did you usually spend sitting on a weekday?

◯ hours per day (OR answer in minutes below) (1) ____

◯ minutes per day (OR answer in hours above) (2) ____

◯ Don't know / Not sure (3)

Q4.1

4. Physical Exercise and Performance
We now have some questions we would like you to answer on physical exercise and performance in your years as an **undergraduate music student (bachelors degree)**.

By physical exercise we mean physical activity (e.g. yoga, brisk walking, running) or sport which is planned and which has, as an objective, the improvement or maintenance of physical *fitness.*

In your years as an **undergraduate music student**, did you normally do physical exercise or sport as part of your daily/weekly routine?

○ Yes (1)

○ No (2)

Q4.2 As a student, did you ever use physical exercise or sport **deliberately to help with performance?**

○ Yes (1)

○ No (2)

Q4.2.1 How frequently did you use physical exercise or sport deliberately to help with performance?

○ Always (1)

○ Very frequently (2)

○ Occasionally (3)

○ Rarely (4)

○ Very rarely (5)

Q4.2.2 In which scenarios did you deliberately use physical exercise or sport to help with performance? Please tick all the options that apply to you.

☐ Practical music examinations (1)

☐ Auditions (2)

☐ Chamber/duo performances (3)

☐ Solo performances (4)

☐ Orchestral performances (5)

☐ Other (6) ____

Q4.2.3 What were the reasons behind your deliberate use of physical exercise or sport to help with performance?

____

____

____

____

____

Q4.3
We now have some questions we would like you to answer on physical exercise and performance in your years as a **professional musician pre-COVID-19.**

By physical exercise we mean physical activity (e.g. yoga, brisk walking, running) or sport which is planned and which has, as an objective, the improvement or maintenance of physical fitness.

In your years as a **professional musician**, did you normally do physical exercise or sport as part of your daily / weekly routine **pre-COVID-19**?

○ Yes (1)

○ No (3)

Q4.3.1
During a typical week pre-COVID-19, on how many days did you usually do physical exercise (e.g. brisk walking, yoga and jogging) or sport?

○ days per week (1) ____

Q4.3.2 What time of day did you usually do physical exercise or sport pre-COVID-19? Please give the reasons behind your choice.

- ☐ In the morning (1) ________________
- ☐ In the afternoon (2) ________________
- ☐ In the evening (3) ________________
- ☐ Whenever I could slot it in (4)

Q4.3.3 How much time did you usually spend doing physical exercise or sport on one of those days?

- ○ hours per day (OR answer in minutes below) (1) ________________
- ○ minutes per day (OR answer in hours above) (2) ________________
- ○ Don't know / Not sure (3)

Q4.3.4 What type of physical exercise or sport did you used to do? Please tick all the options that apply to you.

- ☐ Endurance (e.g. running, biking, swimming) (1)
- ☐ Strength (e.g. lifting free weights, resistance machines) (2)
- ☐ Flexibility (e.g. stretching exercise, yoga) (3)
- ☐ Balance (e.g. tai chi, heel-to-toe walking) (4)

Q4.3.5 At what level of intensity did you usually do physical exercise or sport? Tick all options that apply to you.

- ☐ Light (1)
- ☐ Moderate (2)
- ☐ Vigorous (3)

Q4.3.6 Briefly describe the specific type of physical exercise or sport you used to do.

____

____

____

____

____

Q4.3.7 Why did you exercise?

Starting from the main reason for doing regular physical exercise or sport, please tick any other reasons here:

- ☐ Main reason (1) ________________________________
- ☐ Reason 2 (2) ________________________________
- ☐ Reason 3 (3) ________________________________
- ☐ Reason 4 (4) ________________________________
- ☐ Reason 5 (5) ________________________________

Q4.3.8 As a **professional musician** pre-COVID-19, how often did you maintain your daily / weekly physical exercise or sport on the day of the performance scenarios below? Please give the reasons behind your answers unless you have ticked "not applicable" below.

	Always (1)	Very often (2)	Sometimes (3)	Rarely (4)	Never (5)	Not applicable (6)
Orchestral performance (1)	○	○	○	○	○	○
Chamber/duo performance (2)	○	○	○	○	○	○
Solo performance (3)	○	○	○	○	○	○
Audition (4)	○	○	○	○	○	○

Q4.3.9 What are the reasons for never having done regular physical exercise or sport?

____

____

____

____

____

Q4.4 In your years as a professional musician pre-COVID-19, did you ever use physical exercise or sport **deliberately to help with performance**?

○ Yes (1)

○ No (2)

Q4.4.1 How frequently did you use physical exercise or sport deliberately to help with performance?

○ Always (1)

○ Very frequently (2)

○ Occasionally (3)

○ Rarely (4)

○ Very rarely (5)

Q4.4.2 In which scenarios did you deliberately use physical exercise or sport to help with performance? Please tick all the options that apply to you.

▢ Auditions (2)

▢ Orchestral trial periods (3)

▢ Chamber/duo performances (4)

▢ Solo performances (5)

▢ Orchestral performances (6)

▢ Other (7) ____

Q4.4.2.1 Please select the time of day in which you did **deliberate** physical exercise or sport **prior** to any of the **audition** sessions below. For any of the sessions that do not apply to you, please choose "not applicable."

	Morning (1)	Afternoon (2)	Evening (3)	Don't know / Not sure (4)	Not applicable (5)
Morning audition (1)	○	○	○	○	○
Afternoon audition (2)	○	○	○	○	○
Evening audition (3)	○	○	○	○	○

Q4.4.2.1.1 What type of physical exercise or sport did you used to do? Please tick all the options that apply to you.

▢ Endurance (e.g. running, biking, swimming) (1)

▢ Strength (e.g. lifting free weights, resistance machines) (2)

▢ Flexibility (e.g. stretching exercise, yoga) (3)

▢ Balance (e.g. tai chi, heel-to-toe walking) (4)

Q4.4.2.1.2 Briefly describe the specific type of physical exercise or sport you used to do.

____

____

____

____

____

Q4.4.2.1.3 What were the reasons behind your deliberate use of physical exercise or sport to help with performance?

____

____

____

____

____

Q4.4.2.1.4 Do you think that this deliberate physical exercise or sport had an effect on your performance?

- ◯ Yes (1)
- ◯ Maybe (2)
- ◯ No (3)

Q4.4.2.1.5 What is the effect that this deliberate physical exercise or sport had on performance?

____

____

____

____

____

Q4.4.2.2 Please select the time of day in which you did **deliberate** physical exercise or sport **prior** to any of the **trial orchestral performance** sessions below. For any of the sessions that do not apply to you, please choose "not applicable."

	Morning (1)	Afternoon (2)	Evening (3)	Don't know / Not sure (4)	Not applicable (5)
Morning trial orchestral performance (1)	○	○	○	○	○
Afternoon trial orchestral performance (2)	○	○	○	○	○
Evening trial orchestral performance (3)	○	○	○	○	○

Q4.4.2.2.1 What type of physical exercise or sport did you used to do? Please tick all the options that apply to you.

- ▢ Endurance (e.g. running, biking, swimming) (1)
- ▢ Strength (e.g. lifting free weights, resistance machines) (2)
- ▢ Flexibility (e.g. stretching exercise, yoga) (3)
- ▢ Balance (e.g. tai chi, heel-to-toe walking) (4)

Q4.4.2.2.2 Briefly describe the specific type of physical exercise or sport you used to do.

____

____

____

____

____

Q4.4.2.2.3 What were the reasons behind your deliberate use of physical exercise or sport to help with performance?

____

____

____

____

____

Q4.4.2.2.4 Do you think that this deliberate physical exercise or sport had an effect on your performance?

- ○ Yes (1)
- ○ Maybe (2)
- ○ No (3)

Q4.4.2.2.5 What is the effect that this physical exercise or sport had on performance?

____

____

____

____

____

Q4.4.2.3 Please select the time of day in which you did **deliberate** physical exercise or sport **prior** to any of the **chamber/duo performance** sessions below. For any of the sessions that do not apply to you, please choose "not applicable."

	Morning (1)	Afternoon (2)	Evening (3)	Don't know / Not sure (4)	Not applicable (5)
Morning chamber/duo performance (1)					
Afternoon chamber/duo performance (2)					
Evening chamber/duo performance (3)					

Q4.4.2.3.1 What type of physical exercise or sport did you used to do? Please tick all the options that apply to you.

- Endurance (e.g. running, biking, swimming) (1)
- Strength (e.g. lifting free weights, resistance machines) (2)
- Flexibility (e.g. stretching exercise, yoga) (3)
- Balance (e.g. tai chi, heel-to-toe walking) (4)

Q4.4.2.3.2 Briefly describe the specific type of physical exercise or sport you used to do.

____

____

____

____

____

Q4.4.2.3.3 What were the reasons behind your deliberate use of physical exercise or sport to help with performance?

____

____

____

____

____

Q4.4.2.3.4 Do you think that this deliberate physical exercise or sport had an effect on your performance?

- ○ Yes (1)
- ○ Maybe (2)
- ○ No (3)

Q4.4.2.3.5 What is the effect that this deliberate physical exercise or sport had on performance?

____

____

____

____

____

Q4.4.2.4 Please select the time of day in which you did **deliberate** physical exercise or sport **prior** to any of the **solo performance** sessions below. For any of the sessions that do not apply to you, please choose "not applicable."

	Morning (1)	Afternoon (2)	Evening (3)	Don't know / Not sure (4)	Not applicable (5)
Morning solo performance (1)	○	○	○	○	○
Afternoon solo performance (2)	○	○	○	○	○
Evening solo performance (3)	○	○	○	○	○

Q4.4.2.4.1 What type of physical exercise or sport did you used to do? Please tick all the options that apply to you.

- ☐ Endurance (e.g. running, biking, swimming) (1)
- ☐ Strength (e.g. lifting free weights, resistance machines) (2)
- ☐ Flexibility (e.g. stretching exercise, yoga) (3)
- ☐ Balance (e.g. tai chi, heel-to-toe walking) (4)

Q4.4.2.4.2 Briefly describe the specific type of physical exercise or sport you used to do.

____

____

____

____

____

Q4.4.2.4.3 What were the reasons behind your deliberate use of physical exercise or sport to help with performance?

____

____

____

____

____

Q4.4.2.4.4 Do you think that this deliberate physical exercise or sport had an effect on your performance?

- ○ Yes (1)
- ○ Maybe (2)
- ○ No (3)

Q4.4.2.4.5 What is the effect that this deliberate physical exercise or sport had on performance?

____

____

____

____

____

Q4.4.2.5 Please select the time of day in which you did **deliberate** physical exercise or sport **prior** to any of the **orchestral performance** sessions below. For any of the sessions that do not apply to you, please choose "not applicable."

	Morning (1)	Afternoon (2)	Evening (3)	Don't know / Not sure (4)	Not applicable (5)
Morning orchestral performance (1)	○	○	○	○	○
Afternoon orchestral performance (2)	○	○	○	○	○
Evening orchestral performance (3)	○	○	○	○	○

Q4.4.2.5.1 What type of physical exercise or sport did you used to do? Please tick all the options that apply to you.

- ▢ Endurance (e.g. running, biking, swimming) (1)
- ▢ Strength (e.g. lifting free weights, resistance machines) (2)
- ▢ Flexibility (e.g. stretching exercise, yoga) (3)
- ▢ Balance (e.g. tai chi, heel-to-toe walking) (4)

Q4.4.2.5.2 Briefly describe the specific type of physical exercise or sport you used to do.

____

____

____

____

____

Q4.4.2.5.3 What were the reasons behind your deliberate use of physical exercise or sport to help with performance?

____

____

____

____

____

Q4.4.2.5.4 Do you think that this deliberate physical exercise or sport had an effect on your performance?

○ Yes (1)

○ Maybe (2)

○ No (3)

Q4.4.2.5.5 What is the effect that this deliberate physical exercise or sport had on performance?

____

____

____

____

____

Q4.4.2.6 If you have chosen "other" for scenarios in which you have used deliberate exercise or sport, please select the time of day in which you did **deliberate** physical exercise or sport **prior** to any of the "**other**" performance sessions below. For any of the sessions that do not apply to you, please choose "not applicable."

	Morning (1)	Afternoon (2)	Evening (3)	Don't know / Not sure (4)	Not applicable (5)
Morning performance (1)	○	○	○	○	○
Afternoon performance (2)	○	○	○	○	○
Evening performance (3)	○	○	○	○	○

Q4.4.2.6.1 What type of physical exercise or sport did you used to do? Please tick all the options that apply to you.

- ☐ Endurance (e.g. running, biking, swimming) (1)
- ☐ Strength (e.g. lifting free weights, resistance machines) (2)
- ☐ Flexibility (e.g. stretching exercise, yoga) (3)
- ☐ Balance (e.g. tai chi, heel-to-toe walking) (4)

Q4.4.2.6.2 Briefly describe the specific type of physical exercise or sport you used to do.

____

____

____

____

____

Q4.4.2.6.3 What were the reasons behind your deliberate use of physical exercise or sport to help with performance?

____

____

____

____

____

Q4.4.2.6.4 Do you think that this deliberate physical exercise or sport had an effect on your performance?

- ○ Yes (1)
- ○ Maybe (2)
- ○ No (3)

Q4.4.2.6.5 What is the effect that this deliberate physical exercise or sport had on performance?

____

____

____

____

____

Q4.5 Do you have / have you had any training about physical exercise and performance in your years as a music student?

- ○ Yes (1)
- ○ No (2)

Q4.6 How important do you think it was / would have been to know more about the relationship between physical exercise and performance?

- ◯ Extremely important (1)
- ◯ Very important (2)
- ◯ Moderately important (3)
- ◯ Slightly important (4)
- ◯ Not at all important (5)

Q4.7 Would you be interested in using physical exercise as part of a pre-performance routine?

By physical exercise as a pre-performance routine we mean physical exercise which a performer can engage in systematically prior to his or her music performance.

- ◯ Yes (1)
- ◯ No (2)

Q4.7.1 For what scenarios would having physical exercise as a pre-performance routine be most helpful? Please tick all options that apply.

- ▢ Practical music examinations (1)
- ▢ Auditions (2)
- ▢ Orchestral trial periods (3)
- ▢ Chamber/duo performances (4)
- ▢ Solo performances (5)
- ▢ Orchestral performances (6)
- ▢ Other (7) ____________________

Q4.7.2 If you had to perform in any of the scenarios below, how likely is it that you would perform physical exercise prior to performance? Please give reasons for your answers.

	Extremely likely (1)	Somewhat likely (2)	Neither likely nor unlikely (3)	Somewhat unlikely (4)	Extremely unlikely (5)
Practical music examinations (1)	○	○	○	○	○
Auditions (2)	○	○	○	○	○
Orchestral trial periods (3)	○	○	○	○	○
Chamber/duo performances (4)	○	○	○	○	○
Solo performances (5)	○	○	○	○	○
Orchestral performances (6)	○	○	○	○	○

Q4.7.3 If you were to perform physical exercise prior to performance, which of these would you choose to do? Please choose all options that apply to you.

☐ Endurance (e.g. running, biking, swimming) (1)

☐ Strength (e.g. lifting free weights, resistance machines) (2)

☐ Flexibility (e.g. stretching exercise, yoga) (3)

☐ Balance (e.g. tai chi, heel-to-toe walking) (4)

Q4.8 After any time off or extended time away from performing, do you normally have particular strategies that allow you to develop your **physical skills** to be ready to perform again?

◯ Yes (1)

◯ No (2)

Q4.8.1 What are the strategies that you employ which allow you to develop your physical skills to be ready to perform again?

____

____

____

____

____

Q4.9 After any time off or extended time away from performing, do you normally have particular strategies that allow you to develop your **mental skills** to be ready to perform again?

◯ Yes (1)

◯ No (2)

Q4.9.1 What are the strategies that you employ which allow you to develop your mental skills to be ready to perform again?

____

____

____

____

____

Q5.1 **5. Social Connections** Please answer a few questions on your ***current*** connections to other people.	Strongly agree (1)	Agree (2)	Mildly agree (3)	Mildly disagree (4)	Disagree (5)	Strongly disagree (6)
1. Even among my friends, there is no sense of brother/sisterhood (1)						
2. I feel close to people (2)						
3. I feel disconnected from the world around me (3)						
4. Even around people I know, I don't feel that I really belong (4)						
5. I feel like an outsider (5)						
6. I feel understood by the people I know (6)						
7. I feel distant from people (7)						
8. I am able to relate to my peers (8)						
9. I have little sense of togetherness with my peers (9)						
10. I find myself actively involved in people's lives (10)						

11. I catch myself losing a sense of connectedness with society (11)	○	○	○	○	○	○
12. I see myself as a loner (12)	○	○	○	○	○	○
13. I don't feel related to most people (13)	○	○	○	○	○	○
14. My friends feel like family (14)	○	○	○	○	○	○
15. I don't feel I participate with anyone or any group (15)	○	○	○	○	○	○

Q5.2 The next questions are about how you feel about different aspects of your life. For each one, tell us how often you feel that way.

	Hardly ever or never (1)	Some of the time (2)	Often (3)
1. How often do you feel that you lack companionship? (1)	○	○	○
2. How often do you feel left out? (2)	○	○	○
3. How often do you feel isolated from others? (3)	○	○	○