A self-study of practice: Words versus action in music problem solving

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This study explores the strategies, thoughts, and artistic behaviors involved in learning a new piece for memorized performance. It discusses how an experienced cellist (the first author) prepared the *Prelude* from Bach's Suite No. 6 for cello solo, BWV 1012, for performance. The paper describes her experience and insights as a musician studying her own practice in collaboration with psychologists. This longitudinal case study took place over a period of 3.5 years during which the entire process of learning, memorizing, and giving ten public performances of the Prelude was recorded and analyzed. The results highlight the contrasts between thoughts (articulated in words) and actions (demonstrated through playing). Although a large number of comments were on technique, practice was shaped by general musical understanding, from very early stages of learning. Expert music learning can, therefore, be compared to theories of expert problem solving: identifying underlying principles, developing a deeper understanding of the issues before proceeding, taking steps toward solving the problem guided by a big picture. This is in line with Neuhaus' suggestion that a musician's first goal in approaching a new piece should be to develop an "artistic image" of its musical shape.

Keywords: learning; performing; memorizing; practice; self-study

The pianist and pedagogue Heinrich Neuhaus (1973) suggests that when a great musician first approaches a new piece, "an instantaneous and subconscious process of 'work at the artistic image' takes place" (p. 17). This points to an important characteristic of expert problem-solving: experts start with the big picture while novices plunge into the details without developing a clear idea of the big picture. As a result, their understanding of problems is more superficial and their efforts in problem-solving less effective (Glaser and

Chi 1988). But how do expert musicians form "artistic images" of new pieces? Can this function as a "mental model" which guides practice and learning? Musicians and scientists have long been interested in practice and performance, and research has demonstrated that a minimum of 10,000 hours of deliberate practice are required to achieve expert-levels (Ericsson 1997). Given the number of hours involved in preparing for performance, even small differences in the effectiveness of practice may be important. To detect such differences, this study extends previous methodological approaches by enlisting the cooperation of the artist (i.e. the musician) as a full member of the research team. This study focuses on the comparison of thoughts (articulated in words) and actions (demonstrated through playing) during practice.

METHOD

Participant

Tânia Lisboa was trained in classical cello and piano in Brazil, England, and France and currently lives in London performing as a cello soloist. Due to her initial training as a pianist, she has always chosen to perform from memory.

Materials

The *Prelude* from Bach's Suite No. 6, BWV 1012, was chosen as it explores both the mellow quality and virtuoso aspects of the instrument. Written for a five-string instrument, it presents modern cellists with substantial technical challenges when performed on a modern four-string instrument. Musically, however, the *Prelude* is of comparable richness to the other five Bach Cello Suites. Notated in 104 bars in $^{12}/_8$ time, the piece takes about five minutes to perform.

Procedure

The entire practice of the *Prelude* was video-recorded (75 sessions, 38 hours), including practice sessions (n=21) and public performances (n=10) over a period of 3.5 years. Reports of musical features thought about during practice were provided in copies of the score. These included: bowing, fingering, technical difficulties, dynamics, intonation, and phrasing, along with performance cues for each (see Chaffin *et al.* 2010). During learning, the cellist also talked about musical intentions, goals, focus of attention, and much else to the camera. These spontaneous comments were transcribed and classified by topic. Practice was transcribed by recording the location of starts and stops during practice. Half bars were numbered consecutively from the beginning of the
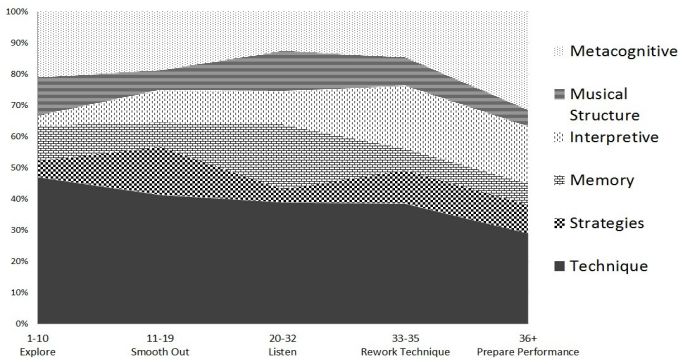
Figure 1. Proportion of categories of comments in each of five stages of learning.

piece. Statistical analyses allowed for comparison between reports and practice, providing an overview of how practice was shaped.

RESULTS

The results highlight a dramatic contrast between words and actions: two different windows into a musician's mind. Generally, words referred to pre-occupations (e.g. with technique), while practice reflected less explicit musical aspects (e.g. intuitions that shaped music-making). Figure 1 shows the proportion of comments (by category) for each of the 5 stages of the learning process: *exploring* (sessions 1-10), *smoothing out* (sessions 11-19), *listening* (sessions 20-32), *reworking technique* (sessions 33-35), and *preparing for performance* (sessions 36-75)—similar to stages identified in previous research (Wicinski 1950, cited in Miklaszewski 1989).

Figure 1 shows that in the initial stages, she made more comments about technique and fewer about interpretation. Across the five stages, the proportion of comments on technique decreased steadily, and the proportion on interpretation increased. The pattern makes sense: first technique, then interpretation. However, this is the opposite of the pattern for practice identified in Figure 2. In the early sessions, comments were mostly about technique because she needed to make decisions about basic fingering and bowing. However, she left the extended work needed to secure technique until much later sessions. Meanwhile, playing was shaped by musical intuitions. She did not talk about these because they were less problematic and also because they were harder to articulate. Later, when working more on projecting musical
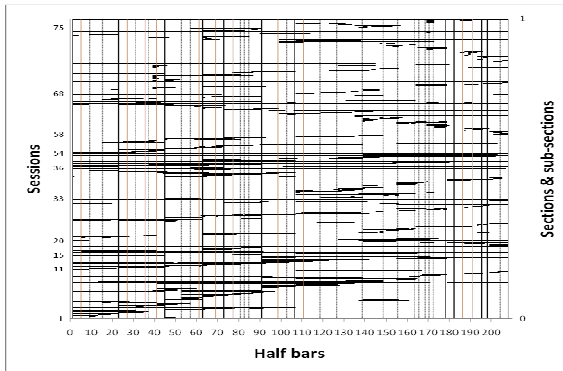
Figure 2. Practice graph of sessions 1-75 with vertical lines marking the locations of sections (dark lines) and sub-sections (paler lines).

ideas, she made more comments about interpretation. Reports of musical features were also related to practice. The main question when analyzing each report was: were starts, stops, or repeats more frequent at places where she reported that kind of feature? If so, it was assumed that she was responding to that aspect of the music. Graphs such as Figure 2 were used (but for each session separately) to highlight when each of these different aspects of the music related to the way in which the piece was practiced. Figure 2 shows the entire record of practice for sessions 1-75.

The graph reads from bottom to top with horizontal lines representing practice *segments*: uninterrupted playing. The horizontal axis represents the music, in half bars. The vertical axis represents successive practice segments. The numbering identifies the first practice segment in selected practice sessions. Inspection shows that she alternated between *section-by-section* and *integrative* practice (Chaffin *et al.* 2010)—a characteristic of expert music practice (Miklasewski 1989). Student musicians, in contrast to experts, are more likely to simply play through the piece (Lisboa 2008). Second, the vertical lines in Figure 2 represent reports of the beginnings of main (harmonic) sections and sub-sections. Inspection shows that she often started and stopped at these locations. The intersections of horizontal lines, representing practice, and vertical lines, representing the reports, show that the formal structure of the music provided a framework for practice. This is another characteristic of expert practice (Chaffin *et al.* 2002). We used multiple regression to simultaneously relate each of the 15 different types of report to the number of starts, stops, and repeats. Table 1 summarizes the results. The top

Table 1. Summary of effects (p<0.01) on practice at each stage of learning. Effects on starts (B), stops (E), and repetitions (R) are shown separately for different types of performance cues and for each type of decision about interpretation and basic technique. Intensive practice (simultaneous effects on starts, stops, and repetitions) is shown in *italics (*condensed from Chaffin *et al.* 2010).

Stage	Explore	Smooth	Listen	Re-work	Prepare performance
Sessions	1-10	11-19	20-32	33-35	36-75
Structural cues					
Expressive/Sections	B	BE	BE	B	B
Subsections	BE	BE	B		BE
Switches	E		E		
Performance cues					
Interpretive				*BER*	*BER*
Intonation				ER	ER
Basic: left hand		ER	ER	E	*BER*
Basic: right hand			*BER*		-E
Interpretation					
Dynamics	*BER*				-R
Sound quality	R	R		R	*BER*
Intonation	R	-E	ER		*BER*
Phrasing		BR			B
Basic technique					
Hand position	R	R	R		R
Fingering					
Bowing/change string		E	ER		E
Technical difficulties			ER		*BER*

two rows of data in Table 1 show that the beginnings of sections and subsections were used as starting and stopping places throughout most of the learning process. Thus, the analyses confirm the conclusion already reached from visual inspection of Figure 2: the musical structure was used as a framework for practice.

DISCUSSION

Decisions about technical and musical issues were interwoven throughout the learning of the *Prelude*. The cellist seemed to have followed Neuhaus's advice

and that her "artistic image" for this piece was developed with the cello and bow in hand. From the outset, practice was organized around the musical structure. In other words, she was thinking about the general musical shape of the piece. Also, priority was given to developing the artistic image over solving technical difficulties. She did not invest in intensive practice of the technical difficulties until she was sure that her musical ideas were going to work. The nature of this project imposed certain strains as for example, inevitable tensions between the first author's roles as artist and research participant, which needed constant management. Deep reflection upon the artistic processes can disrupt the flow of artistic work, a risk of reflection-in-action. She found that providing reports of musical decisions was extremely difficult as she had to exteriorize feelings and intuitions about the music that would normally remain tacit. However, systematic self-study is a good route to improving the effectiveness of one's practice. Self-reflection deepened the cellist's understanding of her musical goals for the *Prelude* and subsequently practice has become more efficient.

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