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Studying a score silently: What benefits can it bring to performance?

Anabela Bravo and Philip Fine

Department of Psychology, University of Buckingham, UK

Mental practice and analysis can be considered as efficacious and useful for performers, as they help them to develop a mental representation of music. This paper discusses what information in the score is potentially useful in developing performance expertise, and how performers can and do utilize it. First, we are concerned with the process of learning and performing a new score and, in particular, in which stages of this process performers find mental practice and analysis with the score useful. Second, we explore what information can be learned from the score before it is performed, i.e. what sort of cognitive representations the performer can obtain from the score. Third, we ask how performers can organize and use that information, i.e. the benefits of mental rehearsal in the attainment of performance excellence. These questions will be addressed through the statements of psychologists, teachers, performers, and musicologists in the relevant literature.

Keywords: expert performance; notated score; cognitive schemas; mental rehearsal; analysis

Mental rehearsal is a cognitive process that complements physical rehearsal and helps lead to the development of performance expertise. For the performer, musical ideas are primarily registered in written notation, and mental rehearsal can take place with or without the score. Studying a score silently has benefits for musicians, and can enhance the quality of the eventual performance. Mental rehearsal with the score enables the musician to gain an understanding of the structure of the piece and to form coherent mental representations of it, including cognitive, auditory, and motor representations. As musicians become more experienced, they become better at interpreting and communicating musical ideas, and also better able to self-evaluate and to consider strategies of learning.

Mental rehearsal with the score is clearly connected with analytical study, and analytical insight no doubt interacts with the performance plan. Understanding levels of structure and hierarchical organization or categorization within various musical parameters, for instance, can help the performer's interpretation. Analysis connotes conceptual skills as well as allowing the improvement of perceptual and motor skills, in particular those related to an expressive performance.

MAIN CONTRIBUTION

Our focus is on exploring how we map the conceptual and perceptual structures in the music to cognitive mental representations through score reading. We will also explore the structure of the learning/performing process of a new score, in connection with the implied cognitive models, to understand better how it can inform performance through feedback.

Mental rehearsal as a learning strategy

Mental imagery has similarities to perception but occurs in the absence of an external stimulus, instead based on information in memory. It relies on internal representations, to which we ascribe specific meanings (Zbikowski 2007). Auditory representations are important in all stages of musical performance preparation, including sight-reading, recalling music from memory, and polished performance (e.g. Repp 2001). Lehmann and Davidson (2002) subdivided mental representations in performance into goal representations, production representations, and representations of the current performance.

Williamon *et al.* (2002) investigated how mental representations in pianists affected their recall of music. They found that pianists used longer practice segments and recalled larger sections of music in the later stages of practice, when they also became more able to shift their attention between different levels of the musical structure.

Through the process of learning contemporary music, Hill (2002) experienced the value of earlier mental practice, which he found was a way of understanding the musical implications of the piece: he writes, "as much as possible is learned before we take a work to the instrument. But the main aim of mental study is to liberate our musicality, to make sure that musical goals—not technical constraints—come first" (p. 143).

Hultberg (2008) described a qualitative and collaborative study with two instrumental students. The two students were able to identify certain complex strategies for exploring musical meaning, which were related to their previous musical education. Two different learning strategies were revealed, one giving

Table 1. The stage(s) of the learning/performing process of a new score when performers find mental practice and musical analysis with the score useful (n=75).

Stage	*Mental rehearsal*	*Analysis of the score*
Sight-reading the score for the first time	33	25
Exploring and getting to know the music	35	41
Becoming fully familiar with the piece	33	34
Playing the whole piece fluently and musically	26	21
Memorizing the piece	32	22
Trial performances	15	9
Other	2	2

priority to exploring structural aspects in the printed score, the other focusing on exploring the music while playing, i.e. auditory rather than visual.

An exploratory survey on performers' experience of mental rehearsal and the importance of music analysis in learning and performing a new piece is currently being conducted. Two questions are pertinent to this paper, and asked at which stages the performers tended to find these strategies most useful. Current results (data are still being collected) for mental practice and analysis are shown in Table 1.

As is apparent from the Table, mental practice is particularly useful right from before initial sight-reading up to memorizing the piece for performance. Score analysis was thought to be most useful while the performer is exploring and becoming fully familiar with the piece, but less so before sight-reading.

What we can learn from the score

At a basic level, we need to observe the global parameters of musical notation, such as clef, key signature, meter, and tempo. At an expert level, performers use knowledge of music theories (explicitly or implicitly) as techniques for obtaining information. According to Williamon *et al.* (2002), music theories present valid descriptions of the cognitive processes in music, they explain how sound is structured in musical contexts, they lead to understanding the underlying processes of mental representations, and they are "hierarchically sophisticated representational systems to describe human cognition" (p. 516). Some relevant music theories are outlined below.

Models of musical perception and cognition

Reductive theories (e.g. Schenker 1979, Lerdahl and Jackendoff 1983) reduce the piece to its underlying contrapuntal-harmonic structure. They can explain how listeners represent what is aurally understood in a piece of music. They may clarify a piece's structure, reveal how it was composed, and draw attention to its hierarchical levels. Harmonic region based theories (e.g. Longuet-Higgins 1987, Lerdahl 2001) evaluate harmonic distance, according to pitch relationships, and map the harmonic progressions along the entire musical piece. They account for sequential and hierarchical harmonic tension, voice-leading, and harmonic attraction. Like reductive theories, they can represent whole pieces of music graphically and succinctly.

Categorization theories (e.g. Deliège and Mélen 1997, Ockelford 2005) account for surface level events and their similarities, transformations, and derivations, and how these events can be categorized. Mathematically based theories (e.g. pitch-class set, see Forte 1973) allow the discovery of rules and their manipulation, explain permutations and combinations, and account for levels of structure, particularly in contemporary music. Descriptive theories explain and describe musical symbols and events along the score in a narrative way. They promote insight into the referential meaning of the piece and guide the aesthetic experience (e.g. Agawu 2009).

We can suppose that all the above theories, which talk mainly about how we represent the music we hear, can be applied to how we analyze the printed notation when we see a score. When expert musicians see a score, the analysis they do may involve hearing the music internally and understanding its structure, therefore creating an association between seeing and hearing.

How performers can utilize that information

The views of music psychologists, music teachers, expert performers (e.g. pianists and conductors), and musicologists can all shed light on the contribution of analysis to music performance.

Aiello and Williamon (2002) describe how mental rehearsal can allow performers to: describe and analyse music in terms of macrostructure and microstructure; learn the landmarks of the piece; and identify melodic and rhythmic patterns, closures, and points of tension and resolution.

In terms of pedagogy, Provost (1994) suggested that teachers should encourage students to sing new pieces they are learning and use ear training exercises, complemented by music theory, enabling more advanced students to develop all the skills needed to play a range of music at a professional level.

Mental rehearsal in expert pianists (Chaffin *et al.* 2002) and conductors (Battisti 2007) has been investigated and shown to contribute to the understanding of musical events, such as form, texture, and other musical dimensions. It also improves interpretation and memorization and provides knowledge of the piece's phrase structure.

According to Howell's (1996) musicological perspective of analysis, analysis enables us to go behind the surface detail and get an overview of the score. Through analysis, performers can become familiar with musical styles, produce informed and aesthetically satisfying interpretations, and better plan, execute, and evaluate general musical performances, including questions of emphasis, articulation, and technique (e.g. bowing and fingering). Analysis also enables performers to discover how different interpretations affect the listener's perception and understanding of the musical work.

IMPLICATIONS

The usage of mental rehearsal and analysis helps various aspects of performance practice, including sight-reading, audiation, memorization, and technique. It also has implications for pedagogy and teaching, by stimulating intellectual inquiry, creative interpretation, and improvisatory skills in the student. A good level of analysis implies expertise and helps performers to be versatile, not least by enabling them to create their own learning strategies, and to acquire a capacity for evaluation of their own (self-evaluation) and others' performances. It enables musicians to generate and use mental representations efficiently, and this aspect is a fundamental requirement to be an expert performer (Lehmann *et al.* 2007). Future studies will investigate the effects of expertise on strategy development.

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Address for correspondence

Anabela Bravo, Department of Psychology, University of Buckingham, Hunter Street, Buckingham MK18 1EG, UK; *Email:* anabela.bravo@buckingham.ac.uk

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