Chapter 3

Heuristics for expressive performance

Daniel Leech-Wilkinson and Helen Prior

<A>Heuristics and Metaphors

This chapter asks what we can learn about expressive performance of Western Art Music from the ways in which performers talk about it. Music is notoriously hard to discuss: sound has a tiny descriptive vocabulary of its own – arguably only two words in English: loud and quiet, with everything else borrowed from other domains (Leech-Wilkinson 2009a, ch. 1, par. 7) – to the extent that one might see almost all talk about music as metaphorical. There is considerable evidence for the use of metaphor in both historical and contemporary musical contexts. Spitzer 2004 traces the use of metaphor in relation to the Western musical canon, drawing on music philosophy and cognitive theory and highlighting not only ways in which music has been described in metaphorical language, but also how a listener might understand music

metaphorically. Others have documented the ways in which conceptual metaphors grounded in basic human experiences shape our understanding of music (Johnson and Larsen 2003). And it is clear from empirical studies that metaphors play a key role for performers', teachers' and students' musical understanding, especially in relation to musical expression (Barten 1992, 1998; Woody 1992).

Taking a long view this reliance on metaphorical vocabulary is unsurprising: what mattered about sound for survival was not its inherent qualities but its cause (Stevens and Byron 2009). With the development of musical cultures and vocabularies, music's value lay in the nature of the experience that sounds produced (Cross and Tolbert 2009). Because music takes so much meaning from its relationship to its causes and the feelings it generates, to say what music is like seems easier and more meaningful than to say what it is. Thus rather than saying, "increasing power in the upper quartile of the frequency spectrum is matched to decreasing inter-onset intervals and increasing sound pressure as the fundamentals of the singer's note-sequence increase in c.p.s.", which for the past 150 years has been technically possible, we still tend to prefer, "the colour brightens as the line surges upwards".

So when Gerald Moore addresses accompanists of Brahms's song 'Von ewige Liebe' he chooses metaphor as the most efficient way of communicating what he believes is required in the performance.

> "Now the music gains momentum and works up to a *forte* ('unsere Liebe ist fester noch mehr'). It is a foothill of the high peak towards which we are working. The accompaniment leaps and surges in waves under the upward curve of the voice then ebbs quietly away in a *ritardando* to a *dolce* in preparation for the final climb." (Moore 1953, 30)

Almost every word here is in one way or another metaphorical (see Table 1), even if some of these examples have become conventionalized (Cameron 2010) so that they are no longer considered metaphorical.[1] *Forte*, for example, has become a standardized technical term, and

[1] Throughout this chapter, we adopt Cameron's view of metaphor as one thing understood in terms of another, which may be expressed through language or gesture, and may reflect underlying cognitive mappings. Such metaphors may reflect affective and socio-cultural influences on the person's understanding of an idea, and are used flexibly or dynamically in discourse (Cameron 2010). Metaphors are not seen here merely as a rhetorical

yet its etymology and use reveal its metaphorical status. Others are less conventionalized ('a foothill'). Many employ fictive motion, the metaphorical motion of an object or *trajector* through space or a *landscape*: [2] in music, both the trajector and the landscape are metaphorical. And underlying most are image schemata of the sort identified by Johnson (1987) as rooted in embodied knowledge of human motion. [3]

[TABLE 1: Metaphors used by Moore]

What this passage explicitly tells us is how, in Moore's view, the musical result should feel for a listener. What is assumed is that the performers will aim to produce a performance that feels as if the musical sequence is leaping and surging, then ebbing away, sharing dynamic features with sea changing its motion due to wind and tide. Such writing assumes that the brain is able to make this kind of cross-modal translation, converting intention into performer action and action into sound, and that the sound will in turn generate in listeners sensations dynamically akin –

---

device, but as an indicator of a mode of thinking that is fundamental to the ways in which we conceptualize the world around us (Gibbs 2008).

[2] Fictive motion, described succinctly in relation to its use in mathematics by Núñez (2010), was first studied by Talmy (1996).

[3] Relevant schemata here including SOURCE-PATH-GOAL, PURPOSEFUL ACTIVITIES ARE JOURNEYS, MUSIC AS MOVING FORCE and MUSICAL LANDSCAPE.

with similar motional and emotional values – to those intended.[4] This kind of cross-modal mapping is central to the notion of metaphorical understanding, whether or not this relates to music (Gibbs 2008), and may reflect underlying neural binding processes (Lakoff 2008).

For a process like this to work, the verbal description is not required. It is only there to provide Moore with a way of describing the feelings his ideal performance of this score should generate. What he expects to happen in practice is that the performer will sense the intended effect as an imagined dynamic profile, or feeling-shape in Stern's terms (Stern 2004, 2010), and will use that sensation to drive the motor actions required to produce the sounds, which in turn are matched through shared dynamic profiles to feelings in the listener. Research concerning mirror neurons may explain some of the underlying processes that connect these dynamic profiles to motor actions (Cox 2001, 2006).

Moore's metaphors, then, offer ways of communicating rather specifically about effects that are impractical to specify in more detailed or technical language, because no vocabulary exists,

[4] Koelsch 2010 is a valuable review of recent work. Eitan and Granot 2006 leads to further reading on cross-modal mapping involving music and human motion.

aside from that of acoustics, to enable specification; indeed, because this metaphorical approach works so well, none is required. There is a good case, then, for looking at these kinds of metaphors, and the ways they are used by performers, in some detail. They function as and represent heuristics, short-cuts based on experience that solve problems too complex to resolve quickly enough using analytical thought.

Heuristics operate in many domains of life. For Matsumoto (2009, 233) a heuristic involves relatively fast cognitive processing in which a 'rule of thumb' is used, as opposed to an algorithm which involves the much slower process of exhaustively comparing all possible options. Heuristic processing involves attending only to those features of a situation that experience has shown to be most relevant, while other features are ignored (Gigerenzer & Brighton 2009, Evans 1984). Simon (1972) proposed that, faced with decisions to make in situations too complex to analyse fully, people set an aspiration level for a solution that is good enough and stop searching for solutions when that level is reached (Gigerenzer & Brighton 2009, 108). For many everyday activities that approach works well: driving a car, judging speed to a corner, it is enough to get round safely, unless you are on a race track, in which case the best angle and speed is essential for winning. While for musicians there may not exist the

computationally ideal solution available to the racing driver, they need solutions that are more than minimally satisfying: it is not enough just to play the notes. To reach the standard of professional peers requires a much higher level of skill. Just as the driver assesses speed, force, angle, and feedback from the car, through experience rather than calculation, the musician assesses notes, speed, loudness, pitch, and feedback from the instrument.

A young lifetime's experience (the minimum 10 years' practice proposed by Ericsson, Krampe & Tesch-Römer 1993) enables this by producing, over and above the skill required to sound the correct notes, a link between how particular musical configurations (notes, combinations, sequences) feel as one listens and how it feels to make music with one's instrument that feels like that. It then becomes easy in performance to draw on that link to make music that feels right, by imagining how the next sound should feel and then using one's experience to generate a sound that feels that way. Managing this through feelings is much faster than through thought, and, thanks both to the speed and the route, enables expressive, as opposed to mechanical, musical performance. The process is conceptualised and taught by using descriptive analogies to label aspects of the dynamics of music and the quality of music-induced feeling so that these terms – labels identifying the practical heuristics – can be used to assist in planning

but especially (since it's not necessary to go through this conceptualising stage in performing) in talking about performance, above all in teaching and to a lesser extent in rehearsing. Wulf and Mornell (2008) note the value of such external foci of attention: they observe that an internal focus of attention (e.g. on the bodily actions required to make a particular sound) interferes with the automaticity of the motor actions, and that an external focus of attention (e.g. sound quality, an expressive effect, or a more abstract, metaphorical understanding of the music) is more efficient. The value of such automatic processing and an external focus of attention is also discussed by Keller (2012).

Barten (1992) described the use of 'heuristic imagery' in teaching and orchestral rehearsals. She derives her ideas of heuristic imagery from Vernon Howard's definition of 'doing something with the imagination' (Howard 1977). This is a far less specific definition of heuristic processing than that of the psychologists discussed above, but Barten's understanding of its use is clearly related:

> 'When language functions heuristically, it can shape both the hearing and the performance of the music. Probably, by suggesting a mode of experiencing, the linguistic

> figure can influence the performance of those who are ready to profit from it in terms of their conceptual and technical preparedness.' (Barten 1992: 55).

There may be much to be learned from paying attention to the ways in which performers talk about being musically expressive in sound. Often this bears little relation to musicological discourse: little of the knowledge *about* music taught to performers (its history, theory, sociology etc) is actually used during performance (though it may have some bearing on choices made in preparation). And little of the knowledge of *how to make* music which they use as they perform is written down or available for discussion or even consciously understood. A major challenge for scholars of music, therefore, is to come to understand better what is the nature of the tacit knowledge-through-experience that musicians draw upon in order to perform well. The aim of this chapter is to shed light on the nature of some of the heuristics used by performers in relation to musical expression, and on the ways they relate to one another, drawing on empirical evidence of musicians' own experiences of using such concepts in their everyday teaching and performing.

<A>Study 1: Musicians use of 'shape' and other concepts

We can get a sense of the variety of interrelated concepts through which this knowledge is accessed from Prior's (2012a) exploration of the ways performing musicians use the concept of shape in relation to music. Asked to nominate words they felt meant the same as shape in talk about performance, 189 musicians provided a total of 404 words they thought referred to similar musical phenomena. More than 80 per cent of the words were nominated by three or fewer participants; so 'shape' appears to be remarkably flexible in application. Yet (or perhaps therefore) almost all recognised its usefulness, with nearly 90 per cent using the term when thinking about how to perform music.

[TABLE 2: Words most commonly nominated to mean 'shape']

Such flexibility is also revealed by the most commonly suggested equivalents (nominated by 10 or more participants), shown in Table 2. These vary widely, with meanings as diverse as phrasing, form, dynamics, emotion, and rhythm. Some variations appeared to be influenced by participants' age, gender and main instrument; more important for this chapter were the configurations in which these shape-related words were commonly nominated together.

Many pairs of words were associated with one another (see Table 2). Participants listing 'phrase' or 'phrasing' were more likely to list 'melody' or 'melodic'. Conversely, no participants who nominated 'phrase' or 'phrasing' also nominated 'meaning', a result considerably lower than statistically predicted ($\chi^2 = 6.41$, df = 1, $p < 0.01$ with Fisher's exact test).[5] Those participants nominating 'structure' were less likely to nominate 'direction' ($\chi^2 = 4.15$, df = 1, $p < 0.05$). There seems to be a tendency for more technical terms to be nominated together and also for more intuitive concepts to group. Thus many participants who nominated form also nominated structure and pattern; and the words associated with 'dynamics' (in the sense of loudness) were also quite technically specific, including melody or melodic and rhythm: similarly, 'melody' was frequently nominated with phrase or phrasing, dynamics and rhythm. By contrast, among the more intuitive concepts, colour tended to be listed with direction, emotion, intensity and meaning. Intensity and meaning were often listed with movement; and those who nominated contour were more likely than others also to nominate line, all words that help a

[5] For those unfamiliar with the Chi squared test, a sample can be divided into two or more groups and the actual responses of those groups compared with the expected responses that would occur if each response was divided equally between the groups. Since the chi-square test uses an approximate method it is only valid with large sample sizes. Small groups of participants require Fisher's exact test which calculates the exact probability of the chi-square statistic (Field, 2009, p. 690).

musician to achieve musical shaping without the use of technical detail. Some of the apparently technical terms may also serve this function: ‘structure’, for instance can be a metaphor similar in meaning to ‘architecture’ as well as a specific technical term. ‘Dynamic’ can relate to movement, as well as to volume or intensity of sound. Finally, some words seemed to span both groups. Intensity, for instance, was listed with colour, movement and rhythm. Arguably, rhythm is a technicality, whereas colour and movement are metaphors. Three terms, expression, feeling and curve, seemed to be nominated more independently, though the data do not suggest why. It is possible, then, that these suggestions reflect underlying biases in thinking about music, for example a focus on form, structure, pattern, phrase, melody and rhythm in some musicians, as against flow, movement, meaning, intensity, colour in others; which is only to say that some find certain conceptualisations of music more useful than others in helping them make persuasive performances. We can see in this plethora of shape-equivalent terms and interrelationships not just the usefulness of shape as a concept for musicians—able to support, and function as a bridge between, both technical and phenomenological discourses—but also the richness of a musician’s vocabulary for words that describe the segmentation and modulation of experience over time. Terms like this are far more useful, this evidence suggests, than the terminology of acoustics or music analysis.

<A> Study 2: Interviews

Deeper insight into the ways in which these terms are put to practical use can be gained by talking to musicians about expressive performance in more depth. Prior (forthcoming) interviewed ten professional musicians, five violinists and five harpsichordists.[6] The instruments were chosen because of the very different expressive means at the performer's disposal: while violinists are able to modulate pitch, timing and loudness in order to induce in listeners a sense that music is expressive, harpsichordists on the face of it seem to have only timing variations at their disposal. One might expect, therefore, to find differences between the ways in which they talk about expressive performance on their instrument.

The interview comprised a mixture of musical demonstrations and discussion, focused around an unfamiliar piece provided by the researcher as well as scores brought by the musicians. For

[6] Ethics approval ref. REP-H/09/10-6. While some participants wished to remain anonymous (and are referred to by their pseudonyms of Bridget, Elsie, Tina, Victor and Yoshi), others wished to be named. Darragh Morgan, Jane Chapman, Julian Perkins, Katharine May and Nathaniel Mander are referred to by their first names throughout this chapter.

the violinists, the unfamiliar excerpt was the first 12 bars of François Devienne's (1759–1803) Sonata for Clarinet in Bb and Pianoforte No. 2, I; for the harpsichordists, Thomas Roseingrave's (1690/1–1766) 'Sarabande' from Complete Keyboard Music LXXXIV (Musica Britannica), ed. Johnstone and Platt, p. 60. Participants were asked to play the unfamiliar piece as they would normally, before describing their thinking; and then to play the piece while focussing on the musical shaping, before describing their thinking once more. Some participants were also asked to repeat the process while trying not to shape the music. Later in the interview, the researcher asked participants how this exercise related to their normal musical practices, and participants demonstrated and discussed aspects of the pieces they had brought, or other pieces in their repertoire. The examples they provided were wide-ranging though the most detailed discussions usually focused on Baroque and Classical repertoire (see Table 3). The interviews were audio- and video-recorded, and participants' speech, gestures and musical demonstrations were analysed using Interpretative Phenomenological Analysis (IPA) (Smith, Flowers and Larkin 2009), elements of metaphor and gesture analysis, and Sonic Visualiser (for full details, see Prior 2012b).

For this chapter, the focus will remain on specific aspects of the findings of the Interpretative Phenomenological Analysis. IPA demands an idiographic focus: that is, the researcher's primary goal is to understand the meaning of the data in relation to each individual participant, rather than to generate overarching laws that are more generally applicable. The process involves several distinct stages of analysis, the first of which is a thorough familiarisation with the data from a single participant and the creation of a summary. Following this are two distinct stages: phenomenological coding demands that the researcher focus very deliberately on the meaning of the data themselves, trying to block out external influences and linked material; interpretative coding allows such links to be made and a deeper understanding gained through the observation of patterns and contradictions. Following this process, themes that appear to be important to the participant are identified: these are clustered and the whole coding process is subjected to peer review. Only at this point are the participants' themes compared in an integrative analysis, before a narrative is constructed outlining the findings.

Prior's integrative analysis suggests that certain words are used to express complex and sophisticated 'packages' of musical ideas in a relatively non-specific way. One such is 'shape', the main focus of her study, but many other examples emerged. Those used by more than one

participant are represented generically in Table 4. Each participant used a selection of these terms within the interviews. The categorisations organising the quotations below emerged from apparent links in the data in the final stage of the IPA and show just how many concepts these musicians hold in common. Nonetheless there are interesting differences that seem to reflect the ways in which their musicianship is shaped by their instrument and its recent playing tradition. These differences will be outlined briefly where applicable.

[TABLE 4: Heuristic ideas used by participants]

<B>Shape and Direction

That music seems to involve movement in a direction is a truism of musical (and particularly harmonic and contrapuntal) analysis (Salzer 1962, Cohen 2001), of music psychology (Clarke 2001), and of embodied metaphor theory (Johnson and Larson 2003). It is not surprising, therefore, to find ideas of both shape and direction used by all participants. As might be expected, they did not provide a clear, shared definition of shape: as Bridget commented, ‘I think shape's one of those terms that's got loads and loads of meanings, depending on the

context.' [Bridget, 00:48:30].[7] Indeed it may be this very flexibility that makes it so useful in relation to music and musical expression.

Direction, for these participants, appears to be closely related to shape: they feel they need to be aware of music's direction [Elsie, 00:23:30; Jane, 00:17:30], to have a sense of where it is going [Elsie, 00:23:30; Jane, 00:17:30; Nathaniel, 01:07:30], which might correspond partly to tessitura [Victor, 00:20:00] and partly to a sense of forward movement.

> Tina: And direction, so ... some sort of forward movement towards the higher point of it, so sort of trying to reach the top of it, and then perhaps away, and relaxing on the way back down again. [00:09:30]
>
> Researcher: What do you mean by a sense of direction?
>
> Julian: Well I think in terms of the gesture, so how a group of notes, you know, is it going towards something or going away from something? [00:21:00]

[7] Figures shown in square brackets denote the time elapsed in the interview in Hours:Minutes:Seconds. The meaning and use of musical shape by these and other musicians is discussed in more depth elsewhere (Prior forthcoming)

Here direction belongs clearly within the schemas MOVING MUSIC or MUSIC IS A JOURNEY in which the musician is a MOVING OBSERVER and STATES ARE LOCATIONS (Johnson and Larson 2003). Musicians are able to identify points where they wish to create a sense of arrival and points that might lead towards this. For many, this is influenced by the harmonic structure: cadences are often described as arrival points [Katharine, 00:07:30]. For Elsie 'it's a structural thing.' [00:23:30]. She and others are aware of larger-scale structure, and this sometimes affects their performance decisions. Not every musician used the term 'direction', but others discussed 'where the music is going' [Yoshi, 00:46:00], the idea of a journey, 'arrival points' [Victor, 00:16:30], or 'coming away' [Darragh, 00:08:00].

These can all be thought of as heuristics within the general heuristic concept of music having direction which itself is a building block for the overarching musical performance heuristic 'shape'. Gigerenzer and Brighton (2009, pp.19-21) use the angle-of-gaze heuristic as an example – the shortcut used by baseball outfielders, adjusting their running speed and direction to meet the ball as it falls by maintaining a steady angle of gaze rather than calculating the angles and speeds – and show it as constructed with a series of building-block decisions: fix gaze on the

ball, start running, adjust speed. Similarly, these musicians achieve a sense of overall shape through a phrase by imagining their playing moving towards a goal, adjusting speeds, loudness, frequency, timbre (as their instrument allows) to create trajectories of sound with a beginning, apex and end.[8] Techniques (building blocks) which they feel they use to create a sense of direction include a very slight increase in tempo leading to an arrival point, and this is confirmed in their musical demonstrations:

> Katharine: Moving another part along a little bit, to [...] help the sense of direction in a phrase. [00:07:00]
>
> Tina: it means you're sort of on the front edge [...] of what you think the tempo is, rather than the back edge. [00:10:00]

[8] Lee and Schögler (2009) explore the mathematical similarity between the trajectories active in human movement and those evident in musical expression.

Direction and shape are also related to a sense of varying importance among notes. For violinists, this identification of important notes seemed to stem primarily from tessitura, though harmonic implications were also very influential for some participants, as indicated by Elsie:

> Elsie: 'Every note should have some kind of shape. And every phrase needs to have a shape. And it all depends on whether the note is important or not, whether the harmony's important or not. [00:13:30]

For harpsichordists, clues were also gained from the tessitura, but harmonic features and the metrical position of notes and chords within a bar, or even a bar's position within a phrase, seemed to be key features to consider. Yoshi commented on the 'hierarchy of the beats of the bar' [00:04:00]; while Julian noted that 'some bars are just more important than others' [Julian, 01:04:30]. Whereas these comments may imply that the composition suggests the relative importance of each note or bar, Bridget felt a greater sense of control herself:

> Bridget: I think [shape] means the phrasing and the direction that the music is taking …, which notes that I'm heading towards that I want to, kind of, make important, and which, for me, is also part of the phrasing [00:10:00]

The heuristics of direction and shape seem to package together expressive devices such as variation in tempo and dynamics and therefore the relative emphasis given to each note played. The application of such a heuristic may occur rapidly and without conscious thought; however, it seems that some of the triggers for the use of a particular heuristic may be accessed consciously, even if the analytical thought processes involved have become sufficiently automatic to be integrated into the overarching heuristics of shape or direction.

<B>Movement and Dance

The sense of movement involved in the direction/shape heuristic can become real for performers. Several participants discussed the ways in which the composition and the expression they wished to create might be communicated through bodily movements, and illustrated in so doing their conscious awareness of their cross-modal understanding of musical

expression. Tina, for example, discussed thinking 'in gesture' or 'movement' [00:11:30], as well as using gestures to demonstrate expressive ideas to colleagues or pupils [00:12:30]. Elsie commented:

> Elsie: Well, the way I shape a phrase is actually […] related to how I would move [...]. It's just a bit of music, but if I was to see what movements my own body would make, you know, […] I was a dancer for a long time […]. And [...] the way I approach music, it's a lot related to […] dancing. [00:29:30–00:30:00]

Julian described how he thinks of shaping in relation to gesture:

> Julian: Shape is … very important. [...] it's partly tied in with gesture, for me, particularly in Baroque music. There's a sense of something having a gesture, [...] and it's quite physical, … and I think that maybe comes from a lot of the music being originated in the dance. ... What's the gesture? I think, … it all ties in with rhetoric, and gesture and shape; they all sort of intertwine. [00:32:00] [9]

[9] For more on links between music and gesture, see Gritten and King (2006; 2011) and Godøy and Leman (2010).

Again, Table 2 shows that ‘gesture’ was commonly nominated by others as a word related to musical shape.

Bridget discussed how she imagines particular actions in order to create a specific sound [00:16:30], and on a larger scale, the movements appropriate to the programme of Vivaldi’s ‘Winter’. She discussed the specific kinds of energy required for each section, not focussing on technical details, but on movement-related ideas enabling her to adopt the appropriate technique, an approach also adopted by Katharine [00:39:30]. Similarly, many participants use movement-based imagery to specify expressive content:

> Jane: You are, or the composer, is the person that's driving this thing, and this is the result of what you're doing, so the instrument is the aeroplane, or is the, the vessel, and then this amazing plume, I just think of that about this, this particular couple of bars, this amazing plume of sound comes out, of different colours [00:53:00]

Johnson & Larson's PERFORMER IS THE MUSIC PERFORMED schema (2003, p.76) can become PERFORMER IS THE INSTRUMENT, a heuristic that allows the closest possible identification between action, expressive sound and experience. Thus Nathaniel discussed the idea of 'connecting' with the instrument he was playing [00:54:30], as well as the idea of 'becoming' the harpsichord, as if the instrument becomes embodied [00:55:00]; and Victor discussed the idea of his violin being a tool for what he wanted to achieve musically, a notion that assumes a degree of embodiment [00:30:30]. Subsequent discussions of 'natural' playing, breathing, and singing may be related (see below).

Elsie used a range of imaginative metaphors, including the idea of a 'laser beam' [01:04:00], colours and associated temperatures and landscapes [00:41:30] and calligraphy [00:37:30]. She commented:

> Elsie: And that's the thing about music, if you use imagery, it makes your muscles do all kinds of things that you don't necessarily have to describe in a minutely physical way [01:01:00]

<B>Natural, Breathing, Singing

The prevalent idea that certain ways of playing a passage seem ‘natural’ might appear to be a way of avoiding searching for a more exact rationale for accepted stylistic practice. On the other hand ‘natural’ playing had for several participants a relationship to breathing and singing, hinting at a belief that this most deeply embodied musical experience acts easily as a reference point for instrumental playing. Julian [00:15:00], Katharine [00:08:30], Darragh [00:22:00] and Elsie [00:04:00] all discussed the idea of thinking about the ‘natural’ places to breathe within a piece of music and used this as a guide for when to allow extra time in their performance. Others think more generally about the way a singer would approach a phrase:

> Julian: If I'm in doubt about phrasing, I'll often sing it to myself, which is very helpful, because I think one of the main things you're trying to do as a harpsichordist is make the instrument sing. I mean that's what we're all trying to do, because if you don't do that it can sound deadly. [00:15:30]

Tina described some slightly more specific technical approaches while illustrating how much easier the idea is to apply than to describe:

> Tina: I guess it, it looks ... like it's a singing sort of melody, so trying to make it fairly smooth, and um, and singing out, uh ... [laughs] whatever that entails, joined up, and ... vibrato, and ... all those sorts of things, general ... violin trying to sing kind of things. [00:03:30]

Nathaniel suggested that his aim is often to make the harpsichord 'sing', sometimes through ornamentation [00:10:30], but also by other means, particularly when the composer indicated this in the score through part-writing, ties and suggestions of over-holding:

> Nathaniel: And again there, the composer's been quite specific about, it's quite high in texture, but he's written where he wants you to sing ... [00:07:00]
> Nathaniel: the clue is in the music, I would say. You just [...] try not to get in the way of what the composer's written, just use what's there on the page, and what you know about how to [...] really let the harpsichord sing, and speak. [00:26:00]

As Doğantan-Dack (2011) notes, the 'singing voice' has long been considered the ideal mode of musical expression, and as a result, pianists often try to achieve a 'singing tone'. Doğantan-Dack suggests that this is achieved through a particular pianistic gesture that is congruent with the gestures used in the vocal tract when singing. It would be interesting to compare the neuromuscular activity and resulting gestures used by pianists, harpsichordists and other instrumentalists trying to achieve a singing tone and to compare these with similar activity in their own vocal tracts and those of professional singers when singing. It is already clear, however, that the conscious awareness of the fine details of touch required for a singing tone on a keyboard instrument are bypassed in favour of the 'feeling' or sense of a singing tone being applied as a heuristic device aiding musical expression.

Sometimes it is difficult to explain why a performance decision seems so right:

> Elsie: It feels natural to me, and right for me to do that.
>
> Researcher: Is that to let the change of harmony be heard, in a technical sense?
>
> Elsie: Yeah, yeah. In a way, yes. [Plays]. It feels natural for me to lighten off there. And

> also, that's after four bars, 1, 2, 3, 4. It feels a natural four-bar phrasing as well. [00:35:30]

Other participants, too, seemed to comment on things that have become ingrained through experience to the extent that they feel completely natural. Two ingredients can be identified in this naturalisation process: first the pervasive influence of current period style (often for these participants, current ideas about historical period styles), instilled in performers through their training in order to make them employable within current ensembles, fulfilling current expectations for expert performance, and secondly the years of practice that have led certain performance solutions to compositional figures to seem inevitable. Darragh, for example, wants the bowing to feel 'natural' within the style of the music he is playing [00:07:30], and commented that he would 'naturally' decrescendo at the end of the phrase because he has been taught to do so for many years:

> Darragh: Whether or not [...] there was a copied decrescendo or diminuendo there, you would naturally do one, because after twenty-five years of being taught that a phrase never ends, you know, uh ... [Plays without a diminuendo] Course not! [00:08:30]

Similarly, Nathaniel described the way in which he was using notes inégales[10] as ‘a natural lilt’, as well as something that he would ‘do naturally’ [00:08:00]. Participants who used this term often did so without acknowledging the possible influence of their experience on what felt ‘natural’, while others acknowledged that experience could play a role. It seems likely that, like tonality, stylistic features and expressive devices used by musicians are absorbed through their enculturation as listeners, as well as through explicit teaching. Practice, too, reinforces automatic behaviour, increasing the number of musical features or techniques that ‘feel natural’ to exploit. As Nathaniel said, ‘Because you just get to know it, and it just becomes a part of what your fingers know. [...] it just feels right.’ [00:27:30]

<B>Speech and Emotion

[10] ‘Notes inégales’ refers to the performance practice whereby paired quavers are performed with unequal durations, usually with the first of each pair slightly longer than the second. For more information, see (Fuller 2012).

The similarity between cues for emotional responses in speech, song, and instrumental music has been well documented (Juslin & Laukka 2003), so it is no surprise to find musicians in Prior's study using speech as a further everyday reference-point. Katharine compared musical shaping to speech several times, in terms of 'having a sense of where your sentence is going' [00:07:30], and taking 'time to breathe' [00:08:30]; she compared playing without shaping to speaking 'on a monotone' [00:11:00], as did Yoshi [00:48:00]. Tina commented:

> Tina: I suppose if you're speaking, if you're reading something out loud, you make sure the words within a sentence carry on, even though you have to articulate each word and things, but you don't ... pause ... until you get to the end of the sentence, you make sure you've got there. [00:11:00]

The context of these three participants' discussions of speech was largely solo performance. Others used similar comparisons to describe ensemble situations. Victor commented on the differences between the ways in which different orchestras play the same piece, comparing it to different groups of actors performing the same play [00:44:00].

The number of interview participants (7 out of 10) mentioning ideas concerning emotion suggests its importance for them, as does its presence as one of the most commonly nominated shape-related terms in Table 2. Indeed, thinking of performing as creating a sequence of emotional states appropriate to the score is so ingrained in musicians that we may ask whether it is a heuristic, a representation of something complex by something simple, rather than a one-to-one representation. One might make the same case for 'expressiveness' as a heuristic essentialising cross-modal similarities between the constantly shifting dynamics of musical sound and internal feeling-states in order to make music's effects easier to explain.

Elsie explained how she uses shaping to convey the emotions the composer represented in the score:

> Elsie: if we just take, [...] any of the Mozart string quartets or the concertos, they have [...] quite clear first subjects, and then the second subject is often slightly more lyrical [...] And he does that clearly on purpose, to change the mood, to change the way the listener feels, basically. And your job as a performer is to do the same: you have to change the way you play it, in order to evoke a different emotional response from your

> listener. Because that's all we do here, we're just communicating emotional responses. We're trying to extract emotional responses from our listeners. [00:24:30–00:25:00]

Alongside the notion that music represents emotion, no less heuristic is the belief that the emotional state is inherent in the compositional structure. By ascribing to the notes themselves effects that are substantially brought to the score by the performer, playing the notes more or less 'lyrically' (a style heuristic that functions here also to package up beliefs about second subjects), the performer gains confidence from the thought that they are respecting the composer's intentions (Leech-Wilkinson 2012). Victor views the score as a coded form of a composer's 'feeling in their head' [00:59:30]. He uses the intervals between the notes in a melody and their underlying harmonic implications to identify the emotional points of the music:

> Victor: the large interval with [...] the E flat, also gives you the emotional, [...] [the] grasp is given by the E flat, because if it was just E natural like the rest of it [Plays], you'd skate over it much more. [Plays] [00:11:30]

Elsie also uses specific musical features to inform her of the kinds of emotions she should try to elicit from her listeners (see Figure 1 online). Nathaniel, too, identified certain areas of the music as having particular emotional qualities, but also recognised his role in shaping the music with appropriate phrasing so that it conveys emotion [00:36:30]. Tina spoke less specifically about score-based triggers for the emotions she might want to convey, suggesting that she feels able to alter the musical shaping to convey different emotions:

> Tina: for example, if you wanted a section to be suddenly really shocking and scary, you might deliberately make the bit immediately preceding it very calm and still. [00:35:30]

Yoshi, too felt that she was able to change the 'mood' of a particular chord to suit its context by playing with varying amounts of spread [00:21:00]. Julian was aware that he could convey emotion to his listeners, but was wary of over-exploiting this in a manner inappropriate to the piece of music he was playing:

> Julian: I mean I don't want to inject this piece with too much meaning, as well, I think it's just a light bit of gallanterie, maybe, and sometimes if you make things, if you emote things too much, it can become a bit wearisome to listen to. Sometimes just sort of stating simplicity is beautiful in itself. [00:28:30]

Thinking of music as a form of communication like speech, that presents emotional states, and finding an appropriate sound for them, appears to enable musicians to perform appropriately, according to local period norms, while bypassing the need to consider every technical parameter involved in doing so. Thinking about playing ‘scary’ or ‘calm’ packages-up, and avoids having consciously to consider, a host of technical specifics, such as tone quality, dynamic and tempo variation and their components in terms of bow pressure, speed and angle, vibrato and left hand pressure on the violin, and touch, spreads and articulation on the harpsichord.

<B>Composer and Audience

Many participants showed considerable respect and admiration for the composer of the music they were playing, discussing ‘fantastic writing’ [Elsie, 00:18:30] or ‘really well-crafted’ musical

features [Nathaniel, 00:38:30]. As suggested under the previous heading, their recognition of a composer's expertise seems to help these musicians create an expressive performance: identifying the relevant musical features enables them to highlight these in sound. Although 'composer' was not a commonly nominated word for questionnaire participants, they did mention a host of technical features that could be seen to highlight their focus on the composer's role (see Table 2).

For some interview participants, performance involves telling their audience a story, guiding or sending a message to the listener [Tina, 00:39:30; Victor, 00:58:00]. This idea seemed to be particularly pertinent to the violinists: only one of the harpsichordists discussed the possibility of thinking about a story underlying the music [Jane, 00:42:00]. This may have been influenced by the repertoire discussed. A suite of baroque dances might be less conducive to story-telling than Vivaldi's *Winter*, which Bridget discussed:

> Bridget: Quite often when I get to the point of performance, I try to actually focus more on the audience. [...] I'm still thinking about the music, but I'm thinking about telling it to the audience, as a story, rather than getting caught up in my own world. [00:40:30]

Timing can be crucial here:

> Darragh: I went through years of experience on the public platform, that what you think you're doing slowly, is usually much faster than what the aural, or your listener's hearing.[...] You know, so you think you're taking loads of time, And actually, it's gone in a flash. Or in fact, nobody hears it at all. So exaggeration [...] it's key, here. [00:25:30]
>
> Yoshi: 'But yeah, a split second longer on that note would make the audience register that harmony'. [00:16:00]

Several harpsichordists mentioned the necessity of listening carefully to the sound being produced, discussing the acoustics of the room [Jane, 00:47:30 and 00:55:30], listening to the resonance of an unfamiliar harpsichord [Jane, 00:55:30], or listening to or following 'what the instrument's telling you' [Jane, 00:49:30; Julian 00:27:00], or as Julian suggested, 'let[ting] the instrument inform you as to how to play' [Julian, 00:26:30].

> Julian: I think it's very important with any instrument [...] to listen to what the instrument's telling you and to respond to it. Not, [...] necessarily in a slavish manner, but [...] part of it's common sense, if you're playing this, in a sort of bathroom acoustic, you're not gonna play it very fast. [00:27:00]

Yoshi used the idea of listening specifically to help her interpretation, sometimes in relation to individual musical lines [00:05:30], and sometimes more generally:

> Yoshi: I think the one thing I keep telling my pupils when I'm teaching, is that on the harpsichord, if you want something to happen on the harpsichord, then you need to think it, and you have to listen to it a lot, and the other thing I get them to do, is to listen to the sound, after the sound has happened, so the end of the sound and that makes a difference, um, to how the phrase ends. [01:03:00]

Thus the notion that the instrument communicates with its player does valuable work in helping players focus their attention, maintaining intense awareness of the progression they are making from sound to sound. As mentioned earlier, listening was not reported as a focal point for

violinists, perhaps because of their use of and familiarity with their own instrument, but perhaps also because control of pitch and timbre requires constant attention at a level that harpsichordists, with only timing and texture to attend to, do not necessarily need in order to play coherently.

<B>Style

Faced with the unfamiliar piece provided by the researcher, many participants tried to gain clues from the score as to the appropriate style. The violinists identified their excerpt as Classical, and this prompted them to shape the composition in particular ways. Bridget described a Classical style of playing as ‘simple’ [00:12:30] and ‘nice and delicate’ [00:14:30]; Tina described it as having as sense of ‘restraint’ [00:04:30] and being ‘poised’ [00:05:00], explaining that she would shape the quavers in the excerpt to make the second of each pair lighter than the first. Darragh described how he would change the bowing to reflect the style of the piece, commenting that ‘if you play this separate, you have more chance of that kind of clean, Classical shape’ [00:10:00]. Style was seen by participants as a guide: it seems to provide a short-cut to many separate stylistic features packaged-up as ‘the Classical style’. Tina, for

example, demonstrated the same excerpt in both a Classical and a Romantic style, noting that she used more vibrato and applied more weight to her bow in the Romantic version [00:06:00]. She also described specific features of the Classical style (see Figure 2).

Two violinists, one of whom (Elsie) specializes in period Baroque performance, discussed Baroque style in some of the repertoire they brought with them. A particularly useful tool for this era appeared to be the Baroque bow, which seemed to act as an instant style-changing device for Darragh, despite the many interpretative possibilities it afforded within its own period style:[11]

> Darragh: if I was to play stylistically, the opening of the [Bach] Partita, E major, on a Baroque bow, [Plays] […] , some people would say, 'Oh, that's by no means the only way you can play it with a Baroque bow; there's thousands of ways', but […] stylistically I'm immediately in a style very different to ... the modern, 19th century, Nuremburger: you know, it's a good solid, expensive German bow. [00:28:30]

[11] For an overview of the differences between a Baroque and modern bow, see Campbell, Greated and Myers (2004, 247–8)

Elsie explained in more detail how she uses the bow to understand the style-related shaping of particular notes:

> Elsie: For example, if we're going to go a little bit earlier, back into the Baroque period, the way the notes, I feel, could be best shaped, I feel, is to do with ... the beautiful shape of this beautiful bow, do you know what I mean?
>
> Researcher: Because it's concave, not convex?
>
> Elsie: That's right, yes, [...] you know, like [Plays]. The notes can just be allowed to develop on their own, especially in slow movements [plays], they have their own phrasing, within each individual note. [00:13:00]

Using a Baroque bow appears to provide these two players with stylistic expressive devices that they do not need to think consciously about or be able to explain: the Baroque bow, they felt, guided them towards an appropriate style.

It seemed that the idea of style need not be limited to a broad historical genre, but could be more specific. Four of the five harpsichordists commented on the dance-like style of their excerpt, which had implications for the way they played. Julian commented that the dance-style prompted him to give the music a feeling of 'one in a bar' with a sense of 'forward momentum' [00:02:30]. Yoshi commented on an up and down movement stemming from the dance [00:09:30]. Jane commented in some detail:

> Jane: I was thinking about what the style would be, what ornaments I could do, perhaps on the second time around ... if I should be thinking things like notes inégales, what ... stylistic things I should be thinking about, ... if a trill should start on the upper note, um ... which parts were melodic and which parts were, just stile brisé, just sort of filling in chordal structures and so on. [00:02:30]

Style therefore appears to carry connotations of how a piece should be shaped, whether that idea of style encompasses a musical period, such as 'Classical style' or a smaller-scale genre, such as a dance. Some aspects of style were likened to 'rules' by three of the harpsichordists (Jane, Katharine, and Julian). These rules, to be found in historical editions and treatises

(Kosovske 2011), work in a similar way, offering ready-made ways of performing particular kinds of compositional figures. They can, however, be broken, and to do so may itself bring a helpful sense of engagement.

> Katharine: I personally feel that you can read a treatise and learn everything off by heart, but that's a very sort of clinical way of just ... applying a piece of knowledge, and sort of putting it onto a piece of music, without it sort of coming a bit more spontaneously. [00:36:30]

In the interviews, style and taste were discussed in close proximity. Bridget noted that non-stylistic playing, such as a wide vibrato in the Classical style, might be considered 'untasteful' [00:14:00]. For Darragh too, style-related performance decisions are bound up with notions of taste.

> Darragh: my brain is wired up to know that this is a piece from the Classical genre, so there's no way I would like to, um, if I had any element of, let's say, taste in me, I would

> never play it: [Plays with Romantic-style audible shifts and fluctuating, wide vibrato]. [00:30:00]

Nathaniel and Tina only mentioned ‘taste’ in passing but appeared to view it as a decision-making factor concerning various possible interpretations or implementations of musical shaping [Tina, 01:14:30], all of which might be stylistic [Nathaniel, 00:47:30].

Katharine’s notion of ‘good taste’ in musical performance has been built up over many years of aural experience, and can override some of the knowledge acquired through treatises:

> Katherine: it's just having ... an understanding of the taste, the ... good taste of music, and that one is constantly acquiring and learning about, so it's, I just guess it comes from experience. You know, the more experienced you are, maybe the older you are, or whatever, or the more you've played, or the more you've listened, or interacted with other musicians, you start to sort of, form your own ideas, or ways that you feel the music should go. And if that happens to contradict what Quantz says, in whenever, then so be it! [00:38:00]

For Jane, the relationship between style and taste is more complicated. Although she commented, 'I suppose, it's all a question of what's good taste, what is indulgent' [00:42:30], she also wondered whether the idea of taste could be innate and style something learned by musicians [00:43:30]. It might be that taste is formed through enculturation,[12] while knowledge of style is something often acquired more consciously. Regardless of the source of such knowledge, it is clear that taste was a word used in varying ways, but with reasonably similar underlying meanings. It might be seen to connote a number of unspoken rules of musical expression, related in part to more- or less-consciously-learned stylistic knowledge, in a relatively unspecific way.

The heuristics displayed within these quotations often seem to be related or even overlap. Figure 3 shows a visual representation of the relationships between them derived from participants' data and reflecting the discussion above. Shaping and direction are seen to be closely related, as participants often mentioned direction when trying to explain their understanding of musical shape. Both of these are related to the idea of identifying important

[12] Enculturation, as Sloboda (1985: 196) states, is 'typified by a lack of self-conscious effort and a lack of explicit instruction'.

notes in the music, which might be influenced by tessitura, harmony, rhythm or structural features: these in turn seemed to be related in part to the particular focus required by a performer's instrument. Sometimes this is accompanied by a clear appreciation or awareness of the composer, which in turn is sometimes related to considerations of style and taste in performance. As well as thinking about the composer, some performers consider the audience when making expression-related decisions, and the importance of listening was highlighted particularly by some of the harpsichordists. The idea of emotion was linked with several other heuristics. Participants felt that a composer was suggesting emotions and that they as performers convey them to an audience. This is achieved in part through identifying important notes in the score and through using everyday ideas such as speech to create a 'natural' way of playing. This sense of natural performance was used in conjunction with the idea of breathing, which was also used in relation to singing through one's instrument. Natural performance expression and the ideas of breathing are linked to ideas concerning gesture and movement, with participants suggesting that musical expression can sometimes be understood in terms of movement or gesture, which can be aided by movement- or dance-related imagery. Finally,

these ideas of movement and gesture are to some extent encompassed in the idea of musical direction, which involves a sense of movement or journeying. [13]

[FIGURE 3: Possible relationships between selected heuristics for musical expression discussed by participants. Numbers in brackets denotes the number of participants who discussed each theme, which is also indicated by the varied colour of each heuristic]

Sometimes heuristics operate on more than one level. Using *notes inégales* or playing notes 'off the string' are building blocks of a heuristic for 'Baroque style', whose characteristics shift over time as a function of general performance style change. Earlier we saw how 'direction' was one of many building blocks of 'shape', which itself, in a heuristic usefully tied to the changes in sound needed to produce it, packages up complex notions of performance expressivity.

---

[13] These patterns could be viewed as relatively idiosyncratic, reflecting these particular musicians' understanding of their shape-related musical practice on one occasion and perhaps in relation to the specific repertoire discussed. However, the prevalence of many of the ideas used by the interview participants among the words nominated by questionnaire participants (Prior 2012a) suggests common ground between the two samples, and evidence from wider literature (examples include Barten 1998; Blum 1980, 1986; Kenyon 1987; Rosen 2002) supports the idea that many of these ideas may be used by performing musicians more generally.

Similarly we saw ‘lyrical’ playing sustaining the heuristic notion that the composer shows the performer what to do. Gigerenzer & Brighton’s 2009 model of heuristics works well from a structural point of view, therefore, especially if we expand it to include multi-level nesting of heuristics; but because its examples are not from artistic practice it does not allow for the process of style change that is so noticeable in musical performance and composition. Shape and style, for example, may remain key concerns for musicians, retaining their value as heuristics, but how they are achieved in sound changes from generation to generation (Leech-Wilkinson 2009b). The structural layering of heuristic practice enables that process with ease, the building blocks changing characteristics while the overarching notions remain the same.

<A>Conclusions

Performers, then, use a rich vocabulary of words and images as heuristics, short-cuts that package-up many interacting technical habits into concepts which, while apparently naïve, are actually rich in associations, meanings and implications acquired through practice, learning, and teaching others. This kind of musicians’-speak, far from falling short of the precision and understanding expected of musicological discourse, actually works more efficiently and precisely than technical description to convey precise intentions. But the intentions concern not

so much the sounding means that must be used; rather the expressive effect that the sounds must achieve. In other words, performers are seeing the end-product as the listener experience in a way that musicology tends not to. Ironically, performers often justify their decisions with reference to musicology, since they have been trained that it matters to be able to do so, but in a sense this tendency too is heuristic in nature, making the job easier to carry out by removing anxiety about the value of artistic choices.

Performance heuristics make playing much easier to control, producing sounds that feel right to hear by learning to make those sounds feel right to play. The process involves matching intended sound to an image, as an aid to producing the precise action required to make a sound able to generate in a listener a feeling response which, if not exactly what the player intended, will nevertheless play its part in the creation of an expressively persuasive performance of the score. Key in this process is the image, which through years of practice and experience has come for each player to encode the essential dynamic, emotional and motional information for the making of particular effects in sound, to the extent that the process now seems ‘natural’. This is

a powerful technique whose multimodal causes still need unravelling.[14] But even at this stage it is clear that the processes driving this chain of translations from idea to affect will reveal much about the nature and effect of music.

<A>References:

Barten, S. S. 1992. The Language of Musical Instruction. *Journal of Aesthetic Education, 26*(2): 53-61.

Barten, S. S. 1998. Speaking of Music: The Use of Motor-Affective Metaphors in Music Instruction. *Journal of Aesthetic Education* 32 (2): 89–97.

Blum, D. 1980. *Casals and the Art of Interpretation*. London: University of California Press.

[14] Future studies might usefully investigate the development of such heuristics in less experienced musicians. Such studies have the potential to reveal the ways in which the negotiation of expression-related problems is addressed consciously and the ways in which these become automatic and reliant on automatic, heuristic processes. Such studies will also allow the identification of simple and more complex expressive problems and the investigation of how these are approached.

Blum, D. 1986. *The Art of Quartet Playing: The Guarneri String Quartet in Conversation with David Blum*. London: Victor Gollancz Ltd.

Cameron, L. 2010. What is metaphor and why does it matter? In *Metaphor Analysis: Research Practice in Applied Linguistics, Social Sciences and the Humanities,* ed. Lynne Cameron & Robert Maslen, 3–25. London: Equinox Publishing.

Campbell, M., C. Greated, and A. Myers. 2004. *Musical Instruments: History, Technology, and Performance of Instruments of Western Music*. Oxford: Oxford University Press.

Clarke, E. F. 2001. Meaning and specification of motion in music. *Musicae Scientiae* 5 (2): 213–234.

Cohen, D. E. 2001. "The Imperfect Seeks Its Perfection": Harmonic Progression, Directed Motion, and Aristotelian Physics. *Music Theory Spectrum* 23 (2): 139-169.

Cox, A. 2001. The Mimetic Hypothesis and Embodied Musical Meaning. *Musicae Scientiae,* 5 (2): 195–209.

Cox, A. 2006. Hearing, Feeling, Grasping Gestures. In *Music and Gesture*, ed. A. Gritten and E. King, 45–60. Aldershot: Ashgate.

Cross, I., and E. Tolbert. 2009. Music and Meaning. In *The Oxford Handbook of Music Psychology*, ed. S. Hallam, I. Cross, and M. Thaut, 24–34. Oxford: Oxford University Press.

Doğantan-Dack, M. 2011. In the beginning was gesture: piano touch and an introduction to a phenomenology of the performing body. In *New perspectives on music and gesture*, ed. A. Gritten and E. King, 243–266. Aldershot: Ashgate.

Eitan, Z., and R. Granot. 2006. How music moves: musical parameters and listeners' images of motion. *Music Perception* 23 (3): 221-247.

Ericsson, K. A., R. T. Krampe, and C. Tesch-Römer. 1993. The Role of Deliberate Practice in the Acquisition of Expert Performance. *Psychological Review* 100: 363–406.

Evans, J. St B. T. 1984. Heuristic and analytic processes in reasoning. *British Journal of Psychology,* 75 (4): 451-468.

Field, A. 2009. *Discovering Statistics Using SPSS*. London: Sage Publications.

Fuller, D. 2012. Notes inégales. In *Grove Music Online*. *Oxford Music Online*. Oxford University Press, accessed October 23, 2012, http://0-www.oxfordmusiconline.com.catalogue.ulrls.lon.ac.uk/subscriber/article/grove/music/20126.

Gibbs, R. W. 2008. Metaphor and Thought: The State of the Art. In *The Cambridge Handbook of Metaphor and Thought*, ed. R. W. Gibbs, 3–13. Cambridge: Cambridge University Press.

Gigerenzer, G., and Brighton, H. 2009. Homo Heuristicus: Why Biased Minds Make Better Inferences. *Topics in Cognitive Science* 1: 107–143.

Godøy, R. I., and M. Leman, eds. 2010. *Musical Gestures: Sound, Movement, and Meaning*. New York and London: Routledge.

Gritten, A., and E. King, eds. 2006. *Music and Gesture*. Aldershot: Ashgate.

Gritten, A., and E. King, eds. 2011. *New Perspectives on Music and Gesture*. Aldershot: Ashgate.

Howard, V. A. 1982. *Artistry: The Work of Artists*. Indianapolis: Hackett Publishing.

Johnson, M. L. 1987. *The Body in the Mind: The Bodily Basis of Meaning, Imagination, and Reason*. Chicago: University of Chicago Press.

Johnson, M. L., and S. Larson. 2003. "Something in the Way She Moves"– Metaphors of Musical Motion. *Metaphor and Symbol* 18 (2): 63–84.

Juslin, P., and P. Laukka. 2003. Communication of Emotions in Vocal Expression and Music Performance: Different Channels, Same Code? *Psychological Bulletin* 129 (5): 770–814.

Keller, P. E. 2012. What movement force reveals about cognitive processes in music performance. In *Art in motion II,* ed. A. Mornell, 115–153. Frankfurt: Peter Lang.

Kenyon, N. 1987. *Simon Rattle: The Making of a Conductor*. London: Faber and Faber.

Koelsch, S. 2010. Towards a neural basis of music-evoked emotions. *Trends in Cognitive Sciences* 14 (3): 131-137.

Kosovske, Y. L. 2011. *Historical Harpsichord Technique: developing* La douceur du toucher. Bloomington: Indiana University Press.

Lakoff, G. 2008. The neural theory of metaphor. In *The Cambridge Handbook of Metaphor and Thought*, ed. R. W. Gibbs, 17–38. Cambridge: Cambridge University Press.

Leech-Wilkinson, D. 2009a. *The Changing Sound of Music: approaches to the study of recorded musical performances*. London: Centre for the History and Analysis of Recorded Music.

Leech-Wilkinson, D. 2009b. Recordings and histories of performance style. In *The Cambridge Companion to Recorded Music*, ed. N. Cook, E. Clarke, D. Leech-Wilkinson, and J. Rink, 246-62. Cambridge: Cambridge University Press.

Leech-Wilkinson, D. 2012. Compositions, scores, performances, meanings. *Music Theory Online* 18/1. http://mtosmt.org/issues/mto.12.18.1/mto.12.18.1.leech-wilkinson.php

Matsumoto, D. 2009. *The Cambridge Dictionary of Psychology*. Cambridge: Cambridge University Press.

Mithen, S. 2005. *The Singing Neanderthals: The Origins of Music, Language, Mind and Body*. London: Phoenix.

Moore, G. 1953. *Singer and Accompanist: The Performance of Fifty Songs*. London: Methuen.

Núñez, R. 2008. A fresh look at the foundations of mathematics: Gesture and the psychological reality of conceptual metaphor. In *Metaphor and Gesture*, ed. A. Cienki and C. Müller, 93–114. Amsterdam: Benjamins.

Prior, H. M. 2012a. Report for Questionnaire Participants (Revised edition). Available from http://www.cmpcp.ac.uk/Prior_Report.pdf

Prior, H. M. 2012b. Methods for exploring interview data in a study of musical shaping. Proceedings of ICPMC-ESCOM 2012, July 2012, Thessaloniki, Greece.

Prior, H. M. Forthcoming. Shape for musicians. In *Music and Shape,* ed. D. Leech-Wilkinson and H. M. Prior.

Rosen, C. 2002. *Piano Notes: The hidden world of the pianist*. London: Penguin Books.

Salzer, F. 1962. *Structural Hearing: tonal coherence in music*. New York: Dover.

Simon, H. 1972. Theories of bounded rationality. In *Decision and Organization: A volume in honor of Jacob Marschak*, ed. C. B. McGuire and R. Radner, 161-176. Amsterdam: North-Holland.

Smith, J. A., P. Flowers, and M. Larkin. 2009. *Interpretative Phenomenological Analysis*. London: Sage.

Spitzer, M. 2004. *Metaphor and musical thought*. Chicago: University of Chicago Press.

Stern, D. N. 2004. *The present moment in psychotherapy and everyday life*. New York: Norton.

Stern, D. N. 2010. *Forms of Vitality: exploring dynamic experience in psychology, the arts, psychotherapy, and development*. Oxford: Oxford University Press.

Stevens, C., and T. Byron. 2009. Universals in Music Processing. In *The Oxford Handbook of Music Psychology*, ed. Susan Hallam, Ian Cross and Michael Thaut, 14–23. Oxford: Oxford University Press.

Talmy, L. 1996. Fictive motion in language and "ception". In *Language and Space,* ed. P. Bloom, M. A. Peterson, L. Nadel, and M. F. Garrett, 211–276. Cambridge, MA: MIT Press.

Woody, R. H. 2002. Emotion, Imagery and Metaphor in the Acquisition of Musical Performance Skill. *Music Education Research* 4 (2): 213–224.

Wulf, G., and A. Mornell. 2008. Insights about practice from the perspective of motor learning: a review. *Music Performance Research* 2: 1–25.