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The polyphonic touch : coarticulation and polyphonic expression in the performance of piano and organ music

Wright, A.J.

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Author: Wright, Andrew

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Part II: Thinking with and about the body

Having introduced the role of embodiment in polyphonic expression, I will now turn to a presentation of some general issues fundamental for research in-and-through practice that have an embodiment focus. When discussing my research proposal with other pianists, I found any mention of the body to be surprisingly controversial. Being a pianist myself, I could understand the objections clearly, and to some degree they are valid and must be addressed. In order to explain the role of the embodiment in shaping musical imagination, it is important to contextualise this research within the wider interdisciplinary field of embodied cognition, and the short primer I present of the claims of embodied cognition can provide a lens through which musicians can understand the role of the body in musical thought. Without yet getting into a discussion of musical gesture, I will present a sampling of research connecting body movement to sounding result in musical performance.

In the following section, musical gesture is the main focus, which is distinguished from body movement in that it is not strictly a physical experience but rather one which operates across a continuum between the body and mind. I will present some descriptors and analytical perspectives that will frame the discussion throughout the rest of this

dissertation. In the last section I will concentrate on the relationship between musical gesture, expressive details and notation, showing how embodied experience is central to musical understanding.

6 The subject/object divide

It is obvious that musicians are relatively good at involving the body in imagination and the mind in embodiment, however the Cartesian paradigm of separation between mind and body persists to a surprising degree in the field of music instruction. This state of affairs reflects a separation between the act of music making and talking about music at a verbal or conceptual level. In pitching my research idea, for example, the most common feedback I got from my pianist colleagues could be given such a voice: “The idea of polyphony of expression is interesting but why must you talk about the performing body?” Such comments expose an underlying presumption that in musical performance, the imagination is a purely mental phenomenon, an autonomous mental category of the Platonic variety, and the body is the obedient slave which executes such ideas. Perhaps the fact that the fingers touch the keys of the instrument leads us to think of the body as an intermediary between the mind and the instrument. Perhaps the disciplining of the body that young musicians undergo at the hands of teachers promotes this idea. In any case, this view is reflected in the separation of technique and musicality in the training of musicians, a separation that is sometimes maintained even at a professional level - at the annual Johannes Brahms Wettbewerb in Poertschach, for example, jurors publicly hold up scorecards with one score for technique and one score for musicianship. Surely separation of technique and musicality is sometimes useful in teaching, but it must be a very temporary separation with a reintegration always in sight. For example, even technical exercises can be played with musical shape, whether or not it is written, and the benefits will be substantially greater.

I think that musicians are reluctant to think about the role of the body for several main reasons, and I will try to give voice to them. To begin with, it can seem that granting the body some part in the process of shaping the music is tantamount to admitting that the

music is not one hundred per cent under conscious control. Further, the influence of bodily factors in the imagination can be viewed as encroaching on the freedom of the imagination rather than an additional avenue that actually expands the imagination. Finally, and most significantly, conscious meddling in movement tends to make the movement self-conscious and stiff. Perhaps these reasons account for the advice given to me by a former teacher, when I introduced my research proposal to him: “But Andrew, there are things that you *shouldn’t* think about too much!”

Before taking a bite, like Eve, from the magic apple, it seems necessary to provide a preliminary response. First I will show that the conscious mind has an objectifying tendency to the detriment of artistic and embodied practices - a problem that is fundamental for the integration of artistic research in expressive artistic practice. I will then show that this is not an insurmountable problem, since the conscious control and the artistic practice can be clearly separated through a conscious process which I call framing, allowing conscious ideas to influence the artistic experience from the periphery of awareness without objectification.

6.1 Objectification of the body

Thinking about the body *at the moment of performance* can lead to exactly the kind of Cartesian subject/object divide that body awareness aims to overcome. Simply stated, the problem with studying the body - or with studying any artistic practice, for that matter - is that when the body is examined, it is objectified in the mind (Legrand & Ravn 2009). In this process originates a subject/object divide where the body and its habits become the object of focus of the “eye” of observational conscious awareness. Because of conscious interference, the quality of movement becomes more granular and less fluid. Rather than enhancing movement and coordination, direct conscious attention interferes to the

detriment bodily coordination. Musicians often call this negative “self-consciousness” which is opposed to being “free.”

Philosopher Dorothee Legrand has proposed a categorisation of body self-consciousness in the form of a) the “invisible body” which is “absent from experience”; b) the “opaque body” which is “taken as an intentional object of consciousness”; and between these two c) the “performative body” which is the “pre-reflective experience of the body itself”; and d) the “transparent body” which is the “pre-reflective bodily experience of the world” (Legrand 2007). What this scheme posits is a scale from total bodily unconsciousness (“invisible body”) to bodily self-consciousness (“opaque body”), where the body is squarely at the centre of attention. Between these extremes lie modes of pre-reflective bodily self-consciousness where the body is in peripheral awareness. The distinction between the body at the centre or at the periphery is key in differentiating between observational reflective self-consciousness and pre-reflective or non-reflective self-consciousness. Such a distinction has been differently articulated by contrasting consciousness of self-as-subject and consciousness of self-as-object (Pinku & Tzelgov 2006) and has been appropriated in mapping the inner experiences of musicians in performance (Schacher 2014, McGuinness 2013).

Allowing for self-awareness without reflective observation may seem obvious to musicians (and others that rely on bodily expertise, such as dancers), but it is not universally agreed upon. Philosopher, cognitive neuroscientist and psychologist Antti Revonsuo, for example, holds that, “by reflective consciousness we mean such states in which the subject not only experiences something but, in addition, can take this experience as an object of further thought... Self-awareness, voluntary control and planning require reflective consciousness” (Revonsuo 2000: 343). Since it is precisely this conscious observational awareness and reflection that is key to artistic research, the effect of such

observation on bodily experience is highly relevant. If we assume the idea that normal experience of musical practice is built primarily on the “transparent body” which is “pre-reflectively experienced as the bodily mode of givenness of objects in the external world” (Legrand 2007: 493) and which conditions how musicians perceive such objects as the musical score and the instrument, and that in the development of musical practice an explicit focus on the body takes place through the “performative body” which is a pre-reflective experience of the body itself, then reflection, being the characteristic of the “opaque body,” puts the body in the centre of observational consciousness. As Legrand herself recognises, even though the possibility of the “performative body” modality is universal, its development represents a certain expertise, which she examines in dancers (Legrand 2007, Legrand & Ravn 2009).

Placing movement at the centre of observational attention alters such movement, since conscious thought processes tend to take over the activity of movement, and these conscious processes are slower relative to the normal goal-directed movement that is performed pre-reflectively (Hermans 2003, Castiello & Jeannerod 1991, Jeannerod 2002). Body movements, then, are fragile with respect to conscious interference. As a consequence, research into embodied experiences such as emotions, aesthetic choices, and gestures in the performing practice must have a built-in protection against the objectification of the body. In the study of instrumental music, the body is already subject to examination and instruction in service of building technique. Becoming conscious of technique is an important educational goal, though it can lead to difficulties. As pianist Claudio Arrau said, in the process of growing up, the period during which a young artist must become conscious is “one of the most difficult periods of his life” (quoted in Horowitz 1982: 241). While such formative experience lead musicians to be sensitive to the different apprehensions of bodily experience, the allergic reaction to any mention of the word

“body” that I encountered in discussing my research with colleagues leads me to believe that an explicit formulation of the inner skill or technique of switching between these modes of self-consciousness is necessary.

The separation in time between reflection and practice is part of many artistic research projects, and it reflects a separation of phases in the artistic process. Reflection about the body may happen during the practice or preparation phase leading up to the performance, according to this model, but by the time of the performance the bodily experiences are sufficiently ingrained so as to happen without this conscious intervention. This separation of the preparation phase and the performance phase takes significant time and rehearsal, and in the profession things sometimes have to be done immediately or very quickly. Specific strategies can be employed to both consciously control movement and insulate it from objectification at the same time; indeed, body movement can be called forth with conceptual or symbolic triggers without reification, even in the moment of performance. Fingering can serve as one such symbolic trigger and different fingerings can result in markedly different body movement, as the research of pianist Jon Verbalis (2012) in topological fingering shows. Rather than a movement, the fingering is what is willed by the conscious mind, but the fingering calls forth a movement that the conscious mind might well predict. Pianist Luigi Bonpensiere describes a technique for creating and anchoring other kinds of mental symbols as triggers. The symbol is combined with a conscious focus on “release” which keeps the conscious mind out of the actual “doing” of movement, while the symbol still allows the conscious mind to direct the movement (Bonpensiere 1953). Of course the symbol is only the conscious part - in order to be realised the underlying embodied knowledge needs to be present.

6.2 Framing

The use of symbols with the simultaneous inhibition of conscious “doing” (and thereby of objectification) of movement is an example of a conscious strategy which I call “framing.” It seems likely that this idea will resonate with all performing musicians, and for that reason it may seem rather obvious. On the other hand, it also seems necessary to elaborate since explicitly formulating such an approach is the only response to those in the profession who still resist research because of its objectifying tendency. Simply stated, framing is the conscious process by which I *separate* or *insulate* a part of my *pre-reflective* experience to protect it from being objectified by the conscious mind.

One experience where framing can be useful is in thinking about memory, specifically in the experience of recall. In my own experience, memory, rather than being merely *conceptual*, is distributed throughout the self. The *kinaesthetic* memory of a sequence of actions is one part, which is inextricably linked to sound memory whereby the sound and the movement trigger each other. The *haptic* sensation of the keys is another part - at the end of one phrase, for example, my hand feels the next note which is perhaps a neighbouring note or the same note, and the feeling of the key surface and edges verifies that my hand is in the right place. The *proprioceptive* feeling of the forming of my hand prepares groups of notes in advance, which are felt as hand shapes. The *emotional* feeling helps to distinguish structural branching moments like the difference between the first and second theme in the exposition and recapitulation in the sonata form, because those moments *feel* different. Of course, what I conceptually know can help at certain moments, but it cannot completely replace these other kinds of memory. However, trying to “work on” memory tends to orient the mind towards the cerebral, whereby the conceptual activity can easily override these other forms of memory. If during a performance I think, “what is the next note?” my conscious mind will search for a conceptual answer, for

example F#, but if I have *framed* these other kinds of memory, then my conscious answer would be to let my ear and hand remember.

As this shows, when I place memory under conscious observation, the conceptual form of memory takes over and suppresses other ways of remembering. In order to reserve a function for these other kinds of memory even under such reflective scrutiny, they need to have a sort of placeholder or symbol in the conscious mind which insulates them from conscious intrusion. This placeholder can be observed, reflected upon, and held squarely in the centre of attention, while the underlying pre-reflective experiences remain at the periphery of awareness. The strategy which I call framing demarcates an inner space of pre-reflective self-consciousness without objectification, with the frame itself representing the conscious placeholder. Somewhat like the function of a “black box,” these frames respond to input in the form of images from the conscious mind, thus the conscious mind stays *indirectly* in control. The frames are also porous in the sense that the experienced bodily outcome can be consciously monitored without objectification.

I use the process of framing very often when I want to consciously modify or represent any embodied artistic process without allowing the conscious mind to interfere. Framing allows for the conscious examination of such processes - one can open the frame and make the process conscious and then close it again to allow it to work unconsciously. If conscious exploration of inner experiences and body movements during research causes self-consciousness, stiffness, a lack of fluidity or any such negative consequence of objectification, framing the experience or movement returns it to its free unconscious fluidity and at the same time reserves a place for it in conscious awareness. In subsequent chapters of this dissertation, I will open many aspects of movement to conscious scrutiny, and framing is necessary to return these movements to the fluidity of unconscious movement with the awareness of consciousness.

Framing can be used in many different contexts. First, a specific movement can be framed, such as a jump between two distant notes. The jump normally is simply goal oriented - when I want to play a specific low F#, for example - my arm automatically gets me there. When I want to modify the actual trajectory shape of my arm as it travels through the air, I can make that trajectory by consciously moving my arm. The arm is responsive, but the movement is self-conscious and therefore not continuously fluid in its coordination as one part of a whole responsive body. By framing the movement, however, I focus on the *imagination* of the trajectory shape that I want to employ and I do not do it, but rather frame it off as something I know my arm can do and which I cannot do as efficiently with the conscious mind. I hold the image of what I want vividly in the imagination and send the energy to initiate the movement, but the frame prevents me from actually *consciously* doing it and the movement happens automatically. In this case, the goal of reaching the F# is replaced by the goal of the imagined trajectory shape of movement resulting in the arrival at the F#.

It is important to note that the eyes have a strong tendency to objectify. Perhaps most pianists have had the experience of looking down at the hands during a performance and suddenly becoming conscious of the movements and the black and white keys and realising that they do not know how to continue. Looking at my arm while it is moving, unless the movement is carefully framed, will lead to objectified movement. When I make the jump as described in the previous paragraph, I look at the goal note *before* I initiate movement, specifically not while my arm is moving. Practicing looking at the right hand or the left hand is an important rehearsal of the framing process.

I have found that through conscious framing I can easily demarcate what parts of inner experience I want to leave unconscious. Framing is reflected most obviously in the alternation between practice and reflection in the artistic research context. But framing

can also circumscribe a part of the body, a movement, a span of time, a section or layer of music, or a feeling. I can frame the attack of an entrance in a chamber music context so my body feels from the other player exactly when to play. Framing can also protect me from the objectifying gaze of an audience or a camera. Body movement is an essential enforcer of framing since individual movements - for example of the fingers or the arm - can be framed together by consciously executed overarching trajectory shapes of movement - for example of the torso.

While framing is simply my own word to describe an inner experience common among musicians, I have found several sources from other disciplines that might provide support for the idea in its application to movement. Framing movement suggests that the process of translating desire or decision to move into actual movement can be accomplished: 1) with direct conscious action or 2) indirectly by imagining the movement and allowing the body to accomplish the movement free from conscious intrusion. This view (or a similar view) is found in other practices and it is also supported by recent empirical research. In the practice of Alexander technique, “inhibition” and “direction” form a certain parallel to framing (de Alcantara 1997, Alexander 1932). As Missy Vineyard, an Alexander technique teacher, explains: “this was an entirely new way of moving [...] Astonishment is barely adequate to describe my reaction” (Vineyard 2007). This way of moving is also described in the famous book *Zen in the art of Archery* by Eugene Herrigel (1953), a book that was recommended to me by my first piano teacher and which was required reading for the students of Arrau²³ (Arx 2014: 75, Horowitz 1982: 97).

From empirical research, the well-documented ideomotor theory (or Carpenter effect) links images and movement (Shin 2010). More significantly, in neuroscience, the

²³ “Don’t think of what you have to do, don’t consider how to carry it out!’ [the master] exclaimed. “The shot will only go smoothly when it takes the archer himself by surprise.” (Herrigel 1953)

recent “Two Action Systems” model of movement contrasts a functional (“top-down”) pathway of movement with a structural (“bottom-up”) pathway of movement. The structural (“bottom-up”) pathway is characterised by a continual integration of and adjustment to perceptual information, forming a dynamic model of the body in relation to its surroundings *without conceptualisation*. The functional (“top-down”) pathway uses conceptual information to control movement, with minimal constraint from the environment (Buxbaum & Kalénine, 2010).

The contrast between bottom-up and top-down control of movement should resonate with the experience of playing for many musicians. When I first began to study *Ondine* from Ravel’s *Gaspard de la nuit*, I found it difficult to play the opening with the evenness and control that I wanted. My teacher at the time gave me an image: “imagine your hand is like a boat riding on the waves of the notes.” That image suggests that the waves, not the boat causes the movement. When I focused on that image in mind and stopped consciously doing the movement but rather let my hand take control, my hand could negotiate with each key to find the exact height during the key release from which the repetition was possible, even if the keys were in a bad state of regulation. The frame in this case was specifically localised to my right hand and the input was an image.



Example 6.1: Ravel *Ondine* from *Gaspar de la nuit* (Durand, 1909)

In summary, artistry is fragile and does not withstand the wrong kind of conscious scrutiny, since artistic or aesthetic endeavours are not exclusively (or even primarily) conceptual. When the conceptual mind begins to examine the artistic process, its objectifying power easily overrides the sensitivities and subjectivities that are necessary parts of artistry. Such a conceptual attitude towards music can be heard in some performances, where the empty shell of ideas - perhaps even brilliant ideas - is devoid of fluid and organic movements and feelings. Framing can reclaim the role of unconscious feelings and bodily experiences by providing a conceptual placeholder for them, thereby protecting them from objectification. The fact that many musicians react negatively to the idea of thinking about the body points to their intuitive understanding that movement should remain at the periphery of self-consciousness, an orientation which can be described through the idea of the givenness of the “transparent body” in the apprehension of the world, or the pre-reflective experience of the “performative body.” When the body is put into the centre of observational consciousness, as it must be in a reflective artistic research engaging with embodied phenomena, it becomes the “opaque body” and causes a subject/object divide within the researcher. Should the goal of using research to further

artistic practices allow unchecked objectification of those practices, it would be to their detriment for this reason. To repeat the wise words of my former teacher: “there are things that you shouldn’t think about too much!” I can both agree and also reply that the inner skill of framing allows movement and subjective experience to be examined and modified by research, disseminated, discussed, disputed and eventually returned to its Eden-like unconscious state of fluidity.

7 Embodied cognition

Framing is a *conscious* experience, and my discussion in the previous section examined how the body, movement and feeling can be represented in the conscious mind without objectification. I have not yet considered how embodiment 1) is foundational to conscious musical thought on a *pre-reflective* level (in the sense of the givenness of the “transparent body” in the apprehension of the world) and 2) represents a certain mode of musical thought *which may be chosen by the performer* and which happens at the periphery of awareness (through the facility of pre-reflective self-consciousness represented by the “performative body”). Research in music in the last decades has increasingly emphasised the role of the body in music making, responding to a broader interdisciplinary trend challenging Cartesian cognitivism.

In particular, neuroscience has provided compelling arguments that Cartesian division between mind and matter can no longer be maintained and that a disembodied mind as such does not exist [...] From that perspective, the subjective world of mental representation is *not* an autonomous category but a result of an embodied interaction with the physical environment. (Leman 2008: 13)

It is important for musicians to become aware of this broader context, since it can help to show how embodiment is part of musical thinking, and hence can suggest how examining and changing patterns of embodiment can expand the musical imagination.

The kind of knowledge that we can consciously express in words is only a small subset of what we know about music - what philosopher Michael Polanyi calls implicit knowledge (Funk & Coeckelbergh 2013). This knowledge has been described as sensory knowledge that results from an interaction with the world and has no propositional content (Polanyi 1969: 126-133). According to philosopher Alva Noë, this sensory

knowledge is the most basic kind of knowledge, forming the foundation upon which propositional knowledge is built (Noë 2004: 120, Funk & Coeckelbergh 2013: 123).

The assertion (upon which the topic of this dissertation depends) that the bodily experience of shaping music is foundational to musical thinking can best be backgrounded with a short introduction to embodied cognition. The paradigm of embodied cognition, which has been supported by research in many disciplines, argues that there is a continuum between mental cognition and bodily interaction with the world. The embodied thesis has been summarised: “Many features of cognition are embodied in that they are deeply dependent upon characteristics of the physical body of an agent, such that the agent's beyond-the-brain body plays a significant causal role, or a physically constitutive role, in that agent's cognitive processing.” (Wilson & Foglia 2011).

One of the historical anchors for embodied cognition is called the enactive approach, which situates cognition in the dynamic interaction of an organism and its environment. “In a nutshell, the enactive approach consists of two points: 1) perception consists of perceptually guided action and 2) cognitive structures emerge from the recurrent sensorimotor patterns that enable action to be perceptually guided” (Varela 1991: 173). Radical enactive cognition takes the enactive approach even further, viewing the hand as an “organ of cognition” (Hutto & Myin 2013: 46). This theory characterises an intertwining between the hand and the brain, and does not distinguish between cognition that takes place in neural circuitry and cognition that takes place in the actual movement of the hand as it interfaces through gesture with the world.

Another historical support for the embodied thesis comes from an examination of metaphors and their role in cognitive processing. In their classic book *Metaphors we Live By*, linguist George Lakoff and philosopher Mark Johnson (1980) argue that metaphor permeates cognition and that metaphor is grounded in our (bodily) experiences. Later,

Johnson (2007) shows how all meaning-forming contents of inner experience (images, metaphors, emotions, etc.) are grounded in bodily interaction with the world, and that the formation of meaning from these bodily experiences is fundamentally aesthetic.

Other research that led to the embodied paradigm has come from the research in the ecological positioning of perception (Gibson 1979), child development (Thelen & Smith, 1994), robotics and artificial intelligence (Clark 1997, Dreyfus 1979) and phenomenology (Merleau-Ponty 1962). In the last decades, vast amounts of empirical research from cognitive science has supported the paradigm of embodied cognition, though embodied cognition remains controversial. Psychologist Margaret Wilson has written a useful presentation of the core claims of embodied cognition:

- 1. Cognition is situated.** Cognitive activity takes place in the context of a real-world environment, and it inherently involves perception and action.
- 2. Cognition is time pressured.** We are “mind on the hoof” and cognition must be understood in terms of how it functions under the pressures of real-time interaction with the environment.
- 3. We off-load cognitive work onto the environment.** Because of limits on our information-processing abilities (e.g., limits on attention and working memory), we exploit the environment to reduce the cognitive workload. We make the environment hold or even manipulate information for us, and we harvest that information only on a need-to-know basis.
- 4. The environment is part of the cognitive system.** The information flow between mind and world is so dense and continuous that, for scientists studying the nature of cognitive activity, the mind alone is not a meaningful unit of analysis.
- 5. Cognition is for action.** The function of the mind is to guide action, and cognitive mechanisms such as perception and memory must be understood in terms of their ultimate contribution to situation-appropriate behavior.
- 6. Off-line cognition is body based.** Even when decoupled from the environment, the activity of the mind is grounded in mechanisms that evolved for interaction

with the environment—that is, mechanisms of sensory processing and motor control. (Wilson 2002: 626)

An interdisciplinary overview of embodied cognition in current research is outside the scope of this dissertation, but such overviews exist elsewhere (Leitan & Chaffey 2014). I would like to emphasise a couple features, however. The first is actually the last of six claims of embodied cognition as described by Wilson: “off-line cognition is body based.” This claim (which is supported by much evidence from cognitive science) argues that activity of the mind is grounded in embodied experience through activation of sensorimotor pathways even when the body is not moving (Wilson 2002: 626).

Transposing this claim to music, if we accept that the body movement of playing is a constitutive part of musical thinking at the instrument, musical thinking away from the instrument is similarly grounded in body movement even when the body is still.

While I do not have the expertise to critique or affirm any of the conclusions of embodied cognition in general or in its specific varieties, I highlight it here first because it supports the importance of the body in the shaping of music (a point which my research in its practical application will demonstrate) and because it resonates with how I incorporate my body in musical thinking in my own practice. It also provides a framework for showing how the thinking with the body and thinking with the mind form a continuity - an argument of central importance to this dissertation.

While the dispute between pure cognitivism and embodied cognition sometimes seems to have an either/or absolutism in the sources I have examined, and while much of the research examines pre-reflective phenomena, I hold that the embodied cognition paradigm can also be used to inspire an *embodied kind of musical thought* that can be employed to a greater or lesser degree in performance by conscious choice. As a performer, if I am aware of how the body anyway underlies my imagination, I am more likely to value and encourage the kind of dynamic shaping that I can do with my body, the

physical pleasure of movement and the resulting expression. This is what Arrau recognises as “interpreting with the body” and explains: “You reach a stage of development where these things are done automatically by the body. When the music has become part of you, when you have digested it, then these movements don’t have to be thought about. At times, I feel very much like a dancer” (Horowitz 1982: 104). Rather than overriding such thinking-through-movement with abstract thought, the performer has the choice to privilege the participation of the body, which itself is inscribed with the embodied knowledge, habits and feelings foundational to aesthetic knowledge. I will save discussion of the structure of such thinking-through-movement for Part III, and this mode of musical thinking will be the foundation for the embodied experience of polyphonic expression described in Part IV.

8 Body movement and sound

The idea that body movement influences musical results is well documented by previous research in many disciplines. Already in 1938 Alexander Truslit discovered that giving performers different movement instructions (whether actual movements or movement images) resulted in measurably different performances (translated in Repp 1993). Linguist Ray Jackendoff (1990: 131) suggests that the movement metaphors we use in talking about music actually come from real physical movements. Musicologists Erik Clarke and Jane Davidson conclude neither “that body movement determines the interpretation of structure, nor that a performer’s conception of musical structure determines body movement” but that “gesture and physicality play a much more integral role than has hitherto been recognised in specifying the character of a performance.” (Clarke & Davidson 1998: 82, 88-89). Furthermore, the relation between movement and the psychology of the performer is explored by Davidson, who also suggests that the body is the source of musical expression that is then abstracted into musical forms (2002: 145).

More recently, concert pianist and artist-researcher Alessandro Cervino has shown one way that movements can be used to succinctly connect with a cascade of expressive details. He shows several alternatives of movements that can be applied to various passages, and he also shows that certain movements do not work on specific passages. By this analysis, he maps one dimension of the performer’s space for creative choice. In his view, presenting these choices of movements through audio-visual means provides a more rigorous description of sound than metaphorical language, the underlying supposition being that gesture at the instrument is both heard and seen, and that changing the gesture influences the sound. He writes that “since there is a link between the sound result one wishes to obtain and the sort of movements one has to perform to that end, a description of the latter could be a valuable way of referring to the former” (Cervino 2013).

In forthcoming research, fortepianist Christina Kobb explores the relationship between body movements and postures described by early nineteenth-century treatises, showing that altering the posture and body movement influences the interpretation of the music. “There’s a different physical feeling to playing, as well as a different outcome” (quoted in Nuwer 2015). In order to empirically ratify her findings, she is doing her research together with Godøy, who analyses her movements with techniques from empirical musicology.

While the strategies and goals behind all of these researches differ, they all indicate that body movement directly affects the sounded musical result. This implies that it is inaccurate to suggest, as for example the Taubman Technique does (Golandsky 2003), that the technical aspect of piano playing can be separated from the imaginative or musical conception. Avoiding the objectifying tendency of the conscious mind is a valid reason for a framing in *conscious experience*, but if this leads the performer to the belief that the mind is autonomous from embodied experience, he is blind to the foundational role of embodied knowledge underlying all musical thought.

9 Musical gesture

Gestural expression is a difficult topic, not because the concept of a gesture is so difficult, but because it looks so obvious that everybody believes to know what it means. This first impression is, however, misleading and it is there that the difficulty arises. The word “gesture” is like “time”: If you are not asked what it means, you know, but if you are asked you cannot tell. Saint Augustin’s famously articulated this fact when asked about time. We shall not give a precise definition of a gesture. Instead, we want to work with an intuitive understanding. (Mazzola 2010: 115)

Body movement, taken at its face value, refers to the physical aspect of the body moving in time. As the concept of embodied cognition suggests, there is a continuum between this physical body movement and mental experiences, a continuum that bridges the Cartesian divide. The concept of musical gesture is useful here since it handily refers to both body movement and its meaning in inner experience. A definition of gesture has been attempted by many researchers (see for example: the introduction and chapter two of Godøy & Leman 2010, Hatten 2004, Gritten & King 2006, Stam & Ishino 2011). While constructing a precise definition is a tempting exercise, it is not necessary for understanding this chapter. Rather than a precise definition I will use a rather intuitive encyclopaedic or categorical definition that includes any sort of movement that one can conceive of, physical or mental, significant or insignificant, visible or invisible, audible or inaudible etc. The context will make the meaning of the term clear. In my experience, the difficulty of writing about gesture arises from separating from the context in which it is embedded. Building a general definition results in a theoretical scramble for inclusiveness that removes gesture from where it belongs: in actual cases of music making. As I will explain later in this chapter, musical gesture, sound, expressive details and notation hang together in meaning - notation cannot be fully understood without gesture, sound cannot be understood without gesture and musical gesture cannot be fully understood without

sound. The fact that gesture itself may or may not be imagined, physically realised, audible, visible, conscious, sound-producing, willed, and so on makes for a dizzying array of possible connections between inner experience, notation and musical performance through gesture.

There are many possible angles from which to analyse gesture, all yielding their own insights or truths. For the purpose of this dissertation the hierarchical structure of gesture - described with the word coarticulation - and its expression in musical details form the most important focus point, since this coarticulation, itself representing the transparent givenness of body structure and schemata in musical thought, provides the basis for examining polyphonic expression through its embodiment. However, in preparation for a definition and discussion of coarticulation, it is necessary to examine several useful analytical viewpoints that describe gesture. The following subsections contain a series of oppositions that will both delineate the relevant aspects of musical gesture, and provide descriptors that will be used later in this dissertation:

Heard - Seen

Intentional - Extensional

Continuous - Discontinuous

Sound-producing - Concurrent

Contour-based - Rhythm-based

In-time - Out-of-time

9.1 Heard - Seen

Empirical study of musical gesture is a field that has rapidly developed in the last decades with the advent of improved motion-sensor technologies - which in turn

enabled empirical studies conducted within the discipline of empirical musicology. These studies almost exclusively focus on musical gesture as a visual experience - measured visually with motion sensors, videos, photographs etc. - rather than a musical gesture that is heard. In almost every case, the visible aspect of a pianist's performance is scrutinised, sometimes in relation to the musical structure, but the music itself is not heard. Of course such an attitude also tends to reduce gesture to body movement, so any lip service to the monistic qualities of gesture (its quality that bridges the Cartesian divide between mind and body) or to the meaning of gesture is not researchable in this context. Perhaps visual phenomena are preferred due to the medium of writing for printed publications, and perhaps because gesture that are seen seem to be more objective than gestures that are heard.

However, analysing gesture from a visual perspective doesn't give a very complete picture even of body movement. For example, contours of movement seen in space are also characterised by tension, and thus similar trajectory shapes can have very different feeling. In analysing the movement of a conductor, for example, the amplitude of the right arm beat patterns gives information to players or singers about the dynamic: most often bigger means louder, smaller means softer. However, the amount of tension in the movement can also readily be perceived. The conductor could make a very intense fortissimo with a small sudden gesture with great tension, and similarly a very soft pianissimo with big gestures executed with a light, floating arm and a relaxed body. Tension can be readily perceived from a second-person perspective, but is invisible to motion sensors.

It is also important to point out that many of the most significant aspects of gesture in piano playing - such as the onset/offset of weight or contours of embodied tension - are entirely invisible, but can clearly be *heard* in the musical performance. These

can only be measured by other non-visual sensors - measurements of key pressure and of muscle activity, for example. These measurements can confirm that such phenomena take place, but combining the data from visual motion tracking devices and these other data sources to draw meaningful conclusions would be difficult.

Research in the field of neuroscience that confirms that gesture and body schemata are used pre-reflectively to make sense of sound. The working of mirror-neurons, by now a well-researched hypothesis, explains our understanding of observed movement by showing that our brains activate the same pathways for movement when we observe a movement executed as when we actually execute the movement. We grasp movement, then, by its simulation in our own movement-related neural structures. It is interesting to note that mirror-neurons similarly activate in response to sound (Leman 2008: 90; Matyja 2015; Kohler 2002; Keysers 2003). The sound of tearing a piece of paper triggers the same neural circuitry for movement that would actually cause the gesture of tearing (Kohler 2002). The functioning of this auditory mirroring has been connected to empathy (Gazzola 2006; Bråten 2007) and the role of such neural structures has been proposed in music listening (Clarke 2005) and musical emotion (Molnar-Szakacs & Overy 2006). An overview by empirical musicologist Godøy (2003) suggests that the gestures producing the sound (hitting, strumming, bowing, singing) are understood or hypothesised by the listener, though his approach has been criticised for including propositional knowledge, which is not necessary for embodied simulation to occur (Schiavio 2014).

9.2 Intentional - Extensional

Gestures can be realised with actual body movement in real time (extension) or they can be imagined (intention). Intentional gestures can be realised in extensional gestures, but extensional gestures do not in themselves need a conscious mental

representation. Thus there is overlap between the two categories and they form a continuum between the mental and the physical (Leman & Godøy 2010: 5).

9.3 Continuous - Discontinuous

If I make a firm fist and lock my wrist and move my arm first to the left and then to the right, the change of direction can be felt as angular or flowing. In the case of an angular change of direction, a sudden impulse causes the reversal of direction. This impulsive quality can be first felt in the arm but as it is intensified can be felt as an impulse in which the body as a whole participates. The ballistic quality to this movement could be characterised as discontinuous. An alternative sort of discontinuity happens with very little energetic impulse when the arm, if only very momentarily, comes to rest at the end of the left swing before initiating movement to the right. The movement feels much less angular but is nevertheless discontinuous because of the fleeting caesura at the moment of direction change.

On the other hand, the left to right corner can be rounded with a more circular gesture, thereby smoothing the two directions of movement into one continuous movement. Most obviously, this smoothing can take place by making a more circular arc of movement, thus introducing a use of a second dimension, creating a two-dimensional plane of movement. However, this is not the only way to smooth the corner. What is very important to pianists is the smoothing that is allowed by the articulation of the wrist. If I open my fist and allow my wrist to be flexible, then the movement around the left-to-right corner does not involve the momentary discontinuity of either a ballistic impulse or a momentary stasis, since the change of direction of the arm happens first and the wrist momentarily continues to the left while the arm has already changed directions before sweeping around the corner to follow the arm. In this scenario, there is a sort of

distribution of the moment of change of direction where by the arm changes direction first followed by the hand. What is significant about this is that it avoids either an impulsive, angular change of direction and also a momentary stasis since either the hand or the arm is always in movement.

Such impulsive or angular changes of direction define a clear division between successive gestures. A smoother corner or one that is smoothed by articulation of the wrist has less of a defined division, and may be perceived as continuous. A simple circular movement of the arm, for example, has continuity through all its iterations, and if each iteration were to be viewed as a separate gesture, the exact moment of division between one gesture and the next would be arbitrary. The iterations of smoothly rounded gestures can be described by a time span which describes the length of the iteration without mapping directly to a certain moment in the music, rather than a segment, which defines starting and ending points for each iteration.

Discontinuity can be felt as several different levels in the body. An angular or impulsive change of direction can be felt just in the hand, circumscribed by smooth movement of the arm. Or the change of direction can have an angular or impulsive quality felt only in the arm, whereby only those muscles that move the arm experience this impulsive discontinuity. Or the shock of the impulsive movement can be felt all the way up through the neck and head. Thus overarching continuities can contain or circumscribe discontinuities at a more peripheral level of the body. Separating these levels of movement is a kind of skill, which occurs naturally to some but must be learned by others. Alexander technique is famously good at teaching students to move their arms smoothly without contracting the muscles at the back of the neck. Piano teachers are sensitive to freedom of the wrist and how it relates to overall coordination. In octave playing, for example, a general clumsiness where shocks of angular movement reverberate from the head to the tip

of the fingers can be easily remedied by reminding the student to allow free articulation of the joints, particularly the wrist. The overall angularity or ballistic shocks of movement are thus smoothed above the wrist, while the hand can still experience fast angular movement.

What emerges from the preceding paragraphs is the beginnings of a description of how gesture itself, conditioned by the movement possibilities of the body and its joints, has hierarchical structural properties. These properties as applied to musical examples will be described at length in Part III. For now it is important to note that activation of these structural levels depends on articulation of joints, and that the continuities or discontinuities that carve out individual gestures are features of individual hierarchical levels. It is by far not a given that every pianist uses all of these structural possibilities. Tension in the wrist, elbow, shoulder that result in ballistic shocks through the whole body are found even among advanced pianists, who manage nevertheless to make their way through difficult passages by sheer willpower. The quality of movement, however, is perceived by listeners since the experience of gestures as angular or smooth, impulsive or steady is a universal part of human experience.

These qualities of movement are of fundamental importance to the *sound* of the instrument, since sound in the pianistic sense is a composite of the actual sound waves and the feeling of gesture expressed through the sound waves. It has long been known that the timbral variation of a single note is limited to the velocity of the keystroke and contact noises, so pianists communicate timbral variation as a composite over groups of notes (see Bernays & Troube 2014 for an overview of research). The overarching composite - which will be analysed in detail in Part III - communicates both the temporal unfolding of continuities and discontinuities and the kinaesthetic feel of the gesture (intentional or extensional) from which it is constituted and towards which it reaches. The sound waves and the overarching musical gesture (which is heard and seen) combine in perception in a

process of sensory integration.²⁴ Details of expression - dynamic, articulation, timing - combine to give the illusion of sound-quality, an illusion which itself points to the givenness of the “transparent body” in perception of sound, a theme which I will further develop in the following chapters.

9.4 Sound-producing - Concurrent

A categorisation of gesture that has gained currency separates gestures into categories of sound-producing gestures (gestures which actually create sound) sound-facilitating gestures (such as the positioning of the hand in the right place on the keyboard) sound-accompanying gestures (movement not directly connected to sound production) and communicative gestures (gestures that communicate through visual signification). Sound-accompanying gestures are sometimes called ancillary gestures (Wanderley 2005) sound-producing gestures are sometimes called effective gestures and communicative gestures are sometimes called figurative gestures (Cadoz & Wanderley 2000).

In some sources (for example Wanderley 2005: 97, Wanderley 2002) sound-accompanying gestures are implied to be subordinate or less important than sound-producing gestures, a prioritization that can be observed in the many studies of musical gesture. Movements of the upper body are sometimes perceived as “extra” or “unnecessary” (Jerde 2006, Jabusch 2006). Godøy (2012) notices and critiques this bias on the grounds that the visual aspect of these gestures contributes to the musical result. I agree with Godøy that sound-accompanying gestures are important, but not only because of their visual aspect.

²⁴ Sensory integration between audio and visual stimuli has long been known in speech perception through the McGurk effect in which *seeing* lips speaking one syllable while *hearing* a differing syllable results in the perception of a third syllable, which is in fact neither heard nor seen (McGurk and Macdonald 1976).

Musicologist Jennifer MacRitchie distinguishes between technical and non-technical or concurrent gestures, rejecting the term ancillary because it downplays the importance of non-technical gestures (MacRitchie 2013). The separation between technical and non-technical tends to downplay the expressive possibility of sound-producing gestures. The word technical, in my mind, recalls the separation between technique and musicality, which I reject. I will thus use the terms *concurrent* and *sound-producing* to describe opposite ends of a continuum of physical movement from the centre of the body to the tip of the fingers or toes.

Concurrent gestures are a form of imagination for the performer where he can feel the shape of the music as he wants it to sound. Thus they are the realisation or working-out of expressive gesture in body movement, which can then be heard in the sounding result. If used that way, they are indirectly sound-affecting gestures.

Furthermore, though they are removed from the site of contact with the instrument by several joints in the body, the kind of muscular activity or tone that coalesces movement across the joints can invite some of the weight onset or offset that these upper body movements can initiate into the actual fingertip itself and thus into the piano key.

Concurrent gestures, then, directly and indirectly influence sound-production.

Concurrent and communicative gestures have been found to have various functions, such as visually communicating expressive intention, communicating with other performers, communicating structural information, and aiding memory (MacRitchie 2013). All of these points are valid. However the main function of concurrent gestures is to help with the working-out of timing, phrasing, and shaping of the music. The structuring that can relate sound-producing gestures and their overarching concurrent gestures will be discussed in Part III.

9.5 Contour-based - Rhythm-based

Musical gesture maps to contours of lines in the score and rhythms as represented in the meter and its possibilities of subdivision and grouping. Contour-based gesture quite literally follows the pitch in its spatial layout on the keyboard, which suggests certain shapes of gesture for each given sequence of notes. Rhythm-based gesture is similar to metrical accents in that it operates on metrical, hyper-metrical and subdivisional affordances of the metrical structure, but is distinct from metrical accents in that it emphasises the continuity *between* such metrical accents as smooth gesture. In other words, metrical accents are applied to single notes, but rhythm based gesture occurs over groups of notes.

Contour-based gesture is also analogous to singing, in that the distance between the notes is felt in such a way that leaps have a certain embodied feeling of resistance. Rhythm-based gesture is analogous to conducting since it emphasises meter and the filling of time between beats, which has many possible expressive descriptors - angular, smooth, tense, relaxed, and so on.

9.6 In-time - Out-of-time:

At this moment, we are faced with many descriptors of gesture - intentional, extensional, sound-producing, concurrent, heard, seen, (or inaudible or invisible), contour-based or rhythm-based. These descriptions combine with each other, so a single gesture can be described with many of those words. The oppositions do not indicate mutual exclusiveness since, for example, a gesture can be both heard and seen, and intentional and extensional gestures overlap in many different ways. One way to order the field of thought is by introducing temporal perspectives. Since my research is conducted from the first person perspective, I shall focus on a classification of the various

manifestations of musical gesture from the first person perspective of the “now” moment in performance. This classification can easily be extended to include, for example, listeners - and I will have something to say about perception or audibility in subsequent sections - but for now I will remain focussed primarily on the first person perspective of the performer.

At the moment of performance, performers have three main vantage points from which to view musical gesture with respect to time. When I am performing, at any instant I inhabit three main positions in relation to the exact moment in the musical score: the *imagination perspective* that precedes the sound, the *playing perspective* at the moment of the sound and the *listening perspective* after the sound. My imagination position is ahead of my fingers, and my listening or reacting position is behind my fingers so these perspectives are *out-of-time* and the playing perspective is *in-time*. Each of these positions is characterised by a sense of musical gesture, and each has a different relationship to the body. The perspectives are closely inter-related and influence each other, not the least because of the repetitive nature of the practice process built up over the years of learning the instrument. In the following subsections I will discuss each of the perspectives. As musician and scientific researcher François Delalande observes:

The instrumentalist’s experience is of a sensorimotor type. The performer uses body and gestures not only to produce sounds but also to receive them. The performer perceives with the hands, mouth, breath, ribcage and so forth. Between production and reception, a tight imbrication is established, quite comparable to what can be observed during infancy.”(Delalande 2003: 314)

9.6.1 Imagination Perspective

The first perspective is in the imagination. Imaginary gestures can include remembered gestures (experienced directly or by observation) that are unrelated to music (walking or swinging for example) or remembered gestures that are related to music but

not to the instrument in question (the pianist might imagine singing a phrase) or gestures that relate directly to the instrument in question (sound-producing gestures.) The latter category refers to the *imagined* bodily movements that precede the *actual* bodily movements that take place as the body actually moves. Imaginary gestures can mimic human or non-human movement or could be freely imagined. Leman writes of *synaesthetic* gestures that relate to perceptions of distance and time, and are imaginary (Leman 2010: 128).

The first person experience of movement developed through a lifetime of interacting with the world provides the starting point for the imaginative experience of gesture. Many kinds of transformations are possible - transformations of the body (“imagine your hands are like the paws of a lion cub” or “imagine your fingers are little hammers”) or of space (“imagine you could reach out and touch the clouds”) or of context (“imagine you are swimming in honey”.) The possibilities are limitless, but they gain their special meaning from their departure from or difference from normal or habitual bodily interaction with the world. This category of imagination is free, but it is an imagination that calls forth body schemata (habitual sequences of motor function formed through interaction with the world) and departs from or modifies them. It could be considered a body-based imagination.

Objects can similarly trigger unconscious body schemata. The neural pathways for this phenomenon are *canonical mirror-neurons* which respond to the sight of an object and represent possible actions that can be performed on or with the object (for an overview of empirical research, see Sinigaglia & Rizzolatti 2015: 337). This pre-reflective activation of neural sensorimotor pathways can in turn influence the activity of playing. If I imagine a fluffy kitten, for example, my playing will not communicate that image but the physical way of apprehending it - stroking it gently - might indeed be expressed. Similarly, if I imagine an image of a funeral that I attended, the image unconsciously triggers a bodily

response of, perhaps, a certain emotion or posture, or even just a memory of such a response. This response permeates my physical demeanour and colours the expressive qualities of gesture.

Stanislavski's "system" places emphasis on the rehearsal and maintenances of such emotional images from one's own personal past. Remembering and physically feeling such experiences strengthens them and makes them useful for actually embodying the emotion of the character in the play. A similar cross-domain transfer thus takes place - the sadness over remembering the death of his grandmother might allow an actor to feel a character's unrelated sadness in a play. The emulsifier between these two unrelated situations is the body and its ability to feel emotion, which is then expressed by the character's gestures, voice, and behaviour. The main difference between Stanislavski's method acting and the type of acting that was prevalent at his time was the idea of working directly with the inner experiences themselves rather than working on their outer manifestations or technique. (The parallel in music would be working on the inner sense of emotion and the felt qualities of gesture as an organic unity rather than their outward manifestations in expressive details.)

Limitless transfer is possible between different domains of imaginary gesture. Dancing, swimming, hammering, plucking, walking, bowing, singing - limitless gestures can be used in the imagination while playing the piano. The transfer may be conscious or unconscious.

Piano teaching is often characterised by the use of images of movement. These can be communicated by verbal or metaphorical description or by actual physical movement. Most often it is a combination of both. When pianist and pedagogue Dmitri Bashkirov teaches in Russian, for example, non-Russian speakers can understand much of what he is teaching simply because he conducts, dances, mimes, demonstrates and gesticulates what

he wants to communicate - a physical expression of the language he uses in his explanations. The communication might be received consciously or unconsciously by the student and might come to expression in the student's playing consciously or unconsciously. When a teacher demonstrates a passage with tense shoulders, for example, the student could pick up the habit of playing with tense shoulders without realising it.

My argument in this section is not intended to imply that the only form of imagination is gestural, but only to bring attention to the fact that movement-related, metaphorical, or emotional imagination is inextricably tied to bodily experience. The imagination, even while not consciously imagining bodily movement or experience, often has the innervations of embodied experience as its pre-reflective substrate. The most important mode of imagination for the musician is sound, which is inextricably related to embodied experience both in production and perception, and thus also in imagination because of its the tight imbrication with playing and listening.

9.6.2 Playing perspective

In the previous section, I wrote that sound-producing gestures (as well as other intentional gestures) can be imagined in the moment before the sound is actually played. This imaginative position before the sound is to be distinguished from the playing perspective, which is the actual in-time extensional gesture. This playing perspective thus has actual body movement as its most outstanding feature, although it also has an "inside" insofar as it is available for examination by the conscious mind. As I argued previously, conscious simultaneous interference with this actual physical movement is detrimental in the moment of performance because due to its objectifying tendency it can lead to self-conscious or stiff movement.

It is equally true that the playing perspective is an action-perception cycle that provides rich sensorimotor (or sensory-kinaesthetic) experiences due to the interaction between the body and the instrument. The specific action-related feedback at various points during the keypress, keys that are irregularly voiced, or feel irregular in touch, the acoustic and spatial dimensions of the room, breathing or coughing of the audience, the physical vibrations felt through the fingertips, and many other sensory experiences are pre-reflectively integrated at the playing perspective. The constant pre-reflective interaction with perceptual information is a feature of the bottom-up pathway of movement proposed by neuroscience (Buxbaum & Kalénine 2010), a pathway of movement that can easily be overridden by undue conscious attention (as I have argued in §6.2). Thus the modification of sound-producing gesture should occur from the imagination perspective and not directly from the playing perspective, creating a kind of framing-in-time which insulates the relatively fragile sensorimotor experience of the playing perspective from conscious interference.

This framing-in-time is a normal skill for musicians, and it is one for which there are several practice strategies. One example is practicing with the addition of caesuras or stops in such a way that the stop provides a moment to think ahead. The following chunk of music is then felt as a unity in gesture. Pianist Frank Merrick, in his book *Practising the Piano* (1960), describes such a technique in which the stop is at least as long as the ensuing chunk, allowing at least enough time for the ensuing chunk to be imagined in advance, while musician and Alexander-technique teacher Pedro de Alcantara (1997) argues that the stop should have a definite rhythmic value. In my experience, the stop can be shortened as the material becomes more familiar until it is so short that it is not heard by the audience, but still provides for the performer a sort of handle with which to grasp the music before it happens. Sometimes in performance, due to some kind of distraction the

fingers start to catch up with the mind, and it is in these unusual and stressful situations that such embedded handles can provide easy leverage to regain the separation between the imagination and playing perspectives.

If the bottom-up pathway of movement (§6.2) with its rich sensorimotor integration is allowed to fully control body movement at the playing perspective, it not only best realises the sound-picture or gestural imagination taken from the imagination perspective, but also adapts those to the actual environment (the instrument, the acoustic, the audience and so on). Since this adaptation to the environment can *modify* the audio-kinaesthetic imagery of the imagination perspective, it can substantially contribute to the shaping of the music in the moment of performance. An attitude of firm or dictatorial control whereby the imaginative perspective creates a rigid, inflexible sound-picture allows for little participation of this bottom-up information, and the result is therefore not well adapted to the environment. A balance of mutual participation between the imaginary experience and the unconscious playing experience provides the best results, and this balance can easily be thrown off by external stressors, such as the pressure of a competition setting, microphones or TV cameras. This balance must therefore be brought into conscious awareness and actively managed through framing (§6.2).

9.6.3 Listening perspective

The listening perspective is the vantage point of listening to the notes that have just been played. It happens after the moment of bodily movement that creates the sound. In the listening perspective, both the sound coming out of the instrument and the feel of musical gesture that those sounds communicate are perceived. It is thus both sound-based and gesture-based. Sometimes the sound or the gesture perceived is not the same as the one imagined before playing the phrase, but in listening to the actual sounds and feeling

the musical gesture they suggest, I can react and let this perspective influence my imaginative shape for the next phrase. Listening can be a sort of revelation since I hear the expression of unconscious gestures that lie within me. While I might have imagined the general shape of the phrase, or an image of the feeling that I want to communicate, allowing my body to fill in the shape calls forth bodily and inner resources of which I am not fully conscious. In that way, playing is a sort of dialogue between conscious planning (imagination perspective), embodied experience including the incorporation of unconscious sensorimotor feedback from the environment (playing perspective) and conscious listening to the musical result as both sound-waves and musical gestures (listening perspective).

Since the sound of the piano is rather immediate, it is pre-reflectively incorporated into the sensory feedback at the playing perspective. However, in organ playing it is often the case that the sound from the organ (or sometimes from one manual of the organ) reaches the ears significantly after the fingers depress the key. The vastly differing spatial extension of organs and the types of actions (mechanical, direct-electric, electro-pneumatic and tubular-pneumatic) create an enormous range of “reaction times” between the keypress and the perception of the resulting sound. The most immediate sensory feedback in this case is the kinaesthetic *feeling* of the sound-producing gestures, which is associated with the playing perspective. The listening perspective *in sound* in this case is quite separate from the playing perspective, insofar as the span of time between the perspectives is greater. However, the kinaesthetic feeling of musical gesture also can be evaluated in hindsight, and this evaluation serves as a kind of kinaesthetic listening perspective of its own. This separation highlights the importance of a strong imagined picture of the sound but also of the expressive shaping of extensional gesture in the playing perspective, since

the embodied musicality at the playing perspective allows for the action-perception feedback at a pre-reflective *kinaesthetic* level.

There is a relationship between the imagination and listening perspectives in the communication of those intentional gestures that do not overlap with extensional gestures at the playing perspective. An imagined gesture can be realised as a continuity in sound which does not have a corresponding continuity in gesture. Thus intentional gestures can be communicated in sound - and perceived at the listening perspective - without being extensionally realised. However, these intentional musical gestures are to some degree an abstraction of gesture from its most immediate form in extensional movement, an abstraction that can be compounded by conscious symbolic representation and further through notation. The overlap between extensional and intentional gesture in the moment of performance is highly desirable because the extensional realisation allows for the most immediate and rich sensorimotor experience of the gesture in real-time.

Since practising the piano involves much repetition, the relationship between the three perspectives in time is constantly rehearsed, and the perspectives become inextricably intertwined. However, their relationship can easily become unbalanced or problematic. The listening perspective is often influenced by imaginative experiences, causing faulty sensory awareness - the performer *thinks* he hears something that he imagines because his imaginative ear is so strong that it influences his actual hearing. In the same way, aspects of sound-producing gesture that are readily audible and undesired can be missed by the performer whose hearing is overwhelmed by imaginative experience. A strong conscious imagination can override the “bottom-up” bodily adaptation to the instrument in the playing perspective, leading to a poor control of the instrument. An imbalance between the perspectives is often heard in concerts, even at the highest professional level: the pianist who imagines he is creating a big majestic sound but who

comes across as violent because of angular sound-producing gestures, the strongly imaginative pianist who cannot adapt to the instrument and is frustrated by notes that do not sound or other imperfections, the pianist who has studied technique as an ergonomic rather than musical phenomenon and thus plays easily but without expression, for example. While feedback from a teacher or recording oneself can help to give a more accurate listening experience, I would argue that a conscious awareness of the relationship between these perspectives is a vital tool for the performing musician since it provides a platform for self-evaluation at the meta- level.

9.7 Involuntary - Allowed - Willed - Willed and overt

From the first person perspective, gesture can originate with several gradations of deliberateness. Characterising a gesture as willed or involuntary is conceptually somewhat slippery and depends on a separation of phases, since, for example, what may begin as a willed decision might after some years of repetition become an unconscious habit. However, if we focus on the performance moment, the performance of *this* piece by *this* performer with *these* body schemata in communication with *this* audience represent a sort of “given conditions²⁵” within which it is possible to make categories along the spectrum from involuntary to willed. It can be noticed that there are no clear boundaries between these categories, but they approximately map a range of inner experience. Drawing on the work about self-expression from philosopher Mitchell Green (2007), I have loosely adapted his four categorisations for expression to music:

Involuntary gestures are either sound-producing gestures required to execute a passage or pre-reflective movements that originate from the unconscious reflexes of the body and are not subject to conscious control. The sound-producing gestures in this

²⁵ A term taken from Stanislavski, see preface.

category are involuntary because the contour (§9.5) of notes and fingerings written by the composer demands a certain pattern of movement stemming from the ecological relationship between the pianist's body and the spatial layout of the keyboard. Large leaps are an obvious example, as well as passages that travel laterally on the keyboard over distances beyond the span of the hand. The gestures are involuntary in relation to the fingering employed. In other words, while changing the fingering can substantially and voluntarily modify the gesture, once the fingering is fixed the movement for its execution is by default involuntary, remaining open to conscious intervention. Redistribution of notes between the hands is an obvious technique for modifying these sound-producing gestures, the opening leap of Beethoven's Hammerklavier Sonata op. 106 standing as a famous example. However, any fingering, once chosen, requires at least a minimum of involuntary embodiment, since the keys must go down, and this minimal activity calls forth body schemata that are involuntary. The performer might be aware of involuntary gestures but unable, under the "given conditions," to modify or suppress them, or he might be unaware of these physical reactions.

Gestures that are *allowed without being willed* are suppressible in the sense that the passages in question can be executed without their employment. This category includes, for example, gestures that might be suggested by the contour of the notes but are not essential to the navigation of the distances on the keyboard. In other words, the pianist *could* suppress these gestures and still execute the passage but he chooses to allow them, reflecting some level of conscious awareness. Like *involuntary* gestures, they originate in a pre-reflective sensorimotor reaction to the environment, but in contrast to involuntary gestures they are suppressible.

Willed gestures are superimposed onto the music by the pianist. They may be formed by choosing between or emphasising contour-based or rhythm-based affordances in the musical score, or by any other conscious interpretive process.

Willed and overt gestures are both superimposed on the music by the pianist and consciously intended to be heard or seen by the listener *as being willed* by the pianist. Later in this dissertation, due to the fact that I explain gestures in musical examples, I do intend those gestures to be *consciously* heard and seen by the reader. In normal concert performance, I intend them be heard *pre-reflectively* but not as being *willed and overt*. Many famous pianists (Lang Lang stands as the most obvious example) engage in gestures that are designed to engage the audience *consciously* and to draw *attention* to the gestures. The gestures are exaggerated in order to make a comment about the act of expression. Expression is shown as a trick or a game that is applied to the music, rather than a sincere extension of inner experience. In certain repertoire, this is a performance ethic that might make more traditional²⁶ performers uncomfortable, but it can be used to great effect in creating musical humour. These self-referring overt levels of expression are built into the social consciousness of our time,²⁷ and their use in music is therefore unsurprising.

²⁶ Traditional in the sense of oriented towards the ethic of being “faithful to the work” or “faithful to the composer’s intentions.”

²⁷ A social consciousness evolved by the advent of social media

10 Musical gesture and its abstraction

Having related sound and musical gesture in a general way, my goal in this section is to characterise the relationship between gesture and musical expression. I will argue that gesture underlies the expressive features of music, which I will call *musical details*. Musical details represent multiple abstractions of one underlying musical gesture, thus they can only be meaningfully taken together. This abstraction of musical details lends itself to notation, which is a further abstraction. Notation, in turn, is thus best understood not through a process of conscious *interpretation* but rather through a process of embodied *understanding* by performers. Supplementing the reading of notation as written *sounds* which are conditioned by *musical details*, I will argue that notation can also be read through *gesture* and that the gestural reading of notation should be primordial to the reading of each individual note or each individual musical detail.

10.1 Expression of gesture through musical details

Musical gesture is characterised by points of strong emphasis and weak emphasis, and therefore gestures can be separated into prefix and suffix gestures, which lead to a point of emphasis and away from a point of emphasis respectively. Musical gestures are expressed in sound during piano performance with three main types of *details*: dynamic, articulatory and temporal. With the word *details*, I refer to only to the abstracted aspects of sound, or the sounding surface of the music, and not the underlying gestures. Dynamic details refer to changes in loudness or softness of the sound. Temporal details include such considerations as tempo changes, rubato and agogics. Articulatory details refer to the spaces or discontinuities between notes, or patterns thereof (again divorced from their gesture - thus not to be confused with articulation in the sense of bodily movement). Since musical gesture can be expressed in any or any combination of these details, it stands to

reason that gesture can be translated between these different expressive details - translated, that is, in the sense of communicating the same strong and weak points and the energetic shaping of prefix and suffix gestures. The interaction between different kinds of details in perception must be accounted for in ascribing any meaning to their analysis. To make this clear, consider the accents in this example excerpted from Schubert's *Moment musicale* no. 3:



Example 10.1: Schubert Moment Musical no. 3 D. 780 (Henle, Gieseking, ca. 1948)

Few pianists would argue that all accents should be *dynamic accents* - that is, louder than the surrounding context - since they can just as well be played as *agogic accents*. Furthermore, these two types of expressive details are related, since how much agogic accent will determine how much dynamic accent can be employed and vice-versa. If I were to play the passage of Schubert with a beautifully proportioned dynamic accent, and then to add an agogic accent on top of it without adjusting the proportion of the dynamic accent, the result would be unmusical. The *combination* of details would be out of proportion. It would be perfectly acceptable, on the other hand, to use only agogic accent and to make the notes in question actually quieter than their surroundings.

Most often, the general patterns of strong/weak emphasis that are expressed in all three details tend to coincide. In the case of the agogic vs. dynamic accents in the Schubert, it is most probable that I will use a combination of the two types. The question is how much. In any case, the relation in perception between these expressive details is indicative of an underlying unity - a unity that points to an underlying gesture.

While this might be extremely obvious to pianists, it is easy to forget in a research context, where empirical evidence as measured by the computer can seem to be the most objective information from which to draw conclusions about a performance. This kind of evidence relies on *separate* measurement of the details of expression, rather than *how they combine* in perception. One researcher who is also a pianist (and who will remain anonymous) recently told me, when discussing the use of beat-tapping software to glean timing information sets from a recording of Chopin played by Arthur Rubinstein, that I would be very surprised with results, since where we *perceive* the rubato has taken place or to what extent does not quite match the timing data results. He said this in order to make the point that our ears are deceiving us, so we need the timing data to make more objective conclusions.

This would be perfectly reasonable if timing, dynamics and articulation were unrelated, but they are not. In our perception, these details coalesce into a felt gestalt - a sense of gesture - which is pre-reflective and underlies any conscious focus that may, subsequently, single out one detail or another. Thus, our senses of the individual kinds of details of expression are influenced by the others, and they can most meaningfully be taken together. Music as a subjective-intersubjective embodied phenomenon has meaning primarily when experienced from first person and second person perspectives since human perception is indispensable for musicality. The givenness of the “transparent body” in perception is felt in the perceptual spillover between types of musical details. The connection between different kinds of musical details, and the underlying connection between musical details and perceived movement, has been tested and confirmed by experimental data (see Eitan & Granot 2006: 237 for a background and experimental data).

There are cases when details taken separately lead to different grouping structures. Consider, for example, this passage from Chopin's Polonaise op. 26 no. 2:

13

Op 26 Nr 2

The musical score for Chopin's Polonaise in E-flat Minor, op. 26 no. 2, is presented in five systems. The first system (measures 1-4) is marked 'Maestoso' and 'pp'. The second system (measures 5-8) includes 'poco rit.', 'accel.', and 'poco'. The third system (measures 9-12) features 'rit. e cresc.', 'accel.', 'rit. e cresc.', and 'a tempo'. The fourth system (measures 13-16) includes 'cresc.', 'ff', and 'con forza'. The fifth system (measures 17-20) is marked 'agitato' and 'sf p'. The score includes various fingering numbers, slurs, and dynamic markings like 'pp', 'p', 'f', 'ff', 'sf p', and 'con forza'. There are also asterisks and 'Ped.' markings indicating pedal points.

Example 10.2: Chopin Polonaise in E-flat Minor, op. 26 no. 2 (Schirmer, Mikuli, 1894)

In the first line, the marking “rit” seems to have an effect of dissipating energy, corresponding to the stable tonic chord, while in the second line the marking “rit e

crescendo” has the effect of building incredible musical tension leading to the outburst that follows. If only the timing is considered, the rit is likely to be considered a marker of a group final.²⁸ However, in combination with the crescendo, the passage in question leads forward to the arrival of the forte in bar 9. Thus, *combinations* of different types of details can result in different felt groupings than *individual* types of details, taken alone, might suggest. Phrase-arching, a concept computationally worked out in the kinematic models of Neill Todd (1992) and both summarised and critiqued by Nicholas Cook (2014: 176-180) relates dynamic and temporal profiles in hierarchically nested phrase structures, but his theory, admittedly aimed at the normative, only encompasses the *coincidence* of temporal and dynamic profiles and not how these profiles *interact*. It has been noted (perhaps obviously) that the kind of tempo curves underlying phrase-arching represent only one possible part of musical expression, which is far more complex (Desain & Honing 1993).

While Todd’s kinematic model, aimed at creating a normative expressive performance from elementary mechanics, equally weights dynamics and tempo, other researchers have tried to match such kinematic models to actual performances, resulting in a weighting variable across the range of hierarchically nested timescales²⁹ (Todd 1992, Windsor & Clark 1997). Which details are given *preference* in musical expression depends on the style of the music, the training of the performer, the ability to control the

²⁸ Grouping rules have been famously theorised by Fred Lerdahl and Ray Jackendoff (1983) in their generative theory, and phrase-final lengthening, the deceleration at the ends of groups, has been explained through much research in the 1980s (Bengtsson and Gabrielsson 1980; Todd 1985; Palmer 1989). Mitchell Ohriner (2012) uses a computer-based temporal analysis to infer performed structure from phrase-final lengthening (which he calls “group-final lengthening”), recognising the interference of lengthenings responding to other parameters, namely meter, melodic contour, and ornamentation, his theory however neglects to consider the combination of temporal lengthening with dynamic change.

²⁹ Nicholas Cook, in critiquing Neil Todd’s kinematic model, mistakenly suggests that Todd’s equal weighting of dynamics and tempo result from the physical model and its apprehension by the vestibular system, which would require such equal weighting (Cook 2014: 178, Todd 1992: 3549). This suggestion misunderstands the aim of Todd’s kinematic model, which aims at the normative, but the more important point is that both authors fail to recognise the foundational status of the body, not just the vestibular system in its observation of self-movement, but the fact that gesture and kinaesthetic experience is itself structured hierarchically, forming the kinaesthetic basis upon which the hierarchical structure that phrase-arching suggests is built. This concept is developed in Part III of this dissertation.

instrument, tradition, taste, and of course the instrument. Nicholas Cook (2014: 182-215), for example, has written about the historical and geographical situatedness of the practice of phrase-arching.

Instrumental differences in the expression of musical gesture through details can be shown by comparing articulation in piano and organ playing. In Baroque organ playing, a small articulatory silence is used before a note to give it an accent (Cyr 1992: 103). This in fact separates the prefix gesture from its point of arrival, a technique that is not strictly necessary on the piano, where the accent can be shown with a dynamic shape forming the prefix and a dynamic accent on the point of arrival due to the touch sensitive dynamics of the piano. Especially on Baroque organs, the attack of the note after such a small silence is heard much more clearly, giving the sense of a point of arrival. This same point of arrival can be emphasised by a mini temporal curve, a version that would sound different but still communicate the same prefix, suffix and point of arrival. Thus the same shape of prefix and suffix gestures, the weak and strong emphases and their gestural filling, are translatable between different kinds of expressive details. Changing the kind of expressive details employed affects the felt expressive quality of the gesture, but the structure of the gesture as it maps to the musical score remains the same.

For this reason, the study of organ, which I undertook after I already completed my formal education as a pianist, gave me a very useful perspective on musical details, gesture and musical expression. My musicianship was so adjusted to the touch-sensitive dynamics of the piano that at the beginning of my organ study, I felt unable to express my musical intentions fully. My teacher, Ben van Oosten, tapped into my musicianship by insisting that I hear the motives and phrases dynamically, and activation of this shaped sound-image, inextricably connected to musical gesture, helped me to shape with more temporal and articulatory inflection. Experimenting with playing the same pieces on organ

and on piano to explore the difference in expressive details has reinforced my conclusion that gesture underlies musical details and that expression of gesture can occur in any combination of available details, and thus that gesture is translatable between those different details of expression.

10.2 Notation and gesture

The true reproduction is the mimicry of a non-existent original. (...) But this mimicry of the non-existent original is at the same time nothing else but the X-ray photography of the text. (...) Its challenge is to make evident all relations, transitions, contrasts, tension and relaxation fields, and whatever there is that builds the construction, all of that being hidden under the mensural notation and the sensorial surface of sounds. (Adorno, quoted and translated in Mazzola 2010: 119)

In the preceding section, I discussed how gesture is expressed in details. In the first place, gesture is expressed in *sound* through these details, but it is also true that they can be expressed through *notation* with expressive and technical markings in musical scores. These expressions hang together and are inseparable from the practice of playing the instrument, since as soon as they are removed from this kind of bodily understanding, they seem like just ink-marks on the page in need of interpretation. To be clear, there is a pathway for translation of notation into sound, much in the way a computer translates a midi-file into sound. But musicians approach scores with their own gestural expertise, and this gestural reading leads to an individual and much more lively sounding result. Supporting the claim that notation can be read with gesture, there is empirical evidence that shows that the mirror neuron system of motor function is activated when professional musicians merely look at a piece of sheet music (Behmer & Jantzen 2011). Thus musicians see groups of notes as objects with gestural affordances, in much the same way humans

perceive objects with gestural affordances such as grasping. This underlies and colours conscious experience.

In the musical examples which follow, I will argue that an understanding of notation can be built on specific embodied meanings that correspond to the experience of gesture through use of legato, slurs, ties, rests, fingerings and accents. Such an argument explains a reading of notation with the body, a reading that considers the ecological knowledge of how the body and its own particular schemata relates to the instruments. With this orientation, gestures are suggested by many forms of notation in scores of different composers. A reading of these composers' notation is predicated on an understanding of style and a comparative view of their other works, but it is equally dependent on continuously evolving traditions of music making. The passing down from generation to generation of the instructions for such a phenomenon as "legato," for example, include not only verbal formulations but also performed demonstrations for how legato should sound, an unconscious transference. The word written word "legato" is thus an empty instruction devoid of semantic meaning that must be filled with these interpretations and understandings. As Maria Joao Pires once said: "What is in the score? It's not even two percent of the music!"³⁰

While expressive details marked in scores have direct effect on the sounding result, affording a direct translation to sound that can be achieved, for example, by a computer, they can also be read through gesture. In the latter case, the performer's own action-oriented perception makes sense of the score as a sequence of possible actions, a process which happens pre-reflectively anyway (Behmer & Jantzen 2011, Leman 2008: 90), but can be made magnified to result in actual movement. As musicologist Marc Leman states, "if perception is covert action, then there may be tricks or techniques to turn

³⁰ In a masterclass that can be found on YouTube:
https://www.youtube.com/watch?v=Wt44_q73SGs (accessed 29/1/2016)

this covert action into overt action" (Leman 2008: 90). The order or priority is important, so in other words the sequence of reading is better understood as:

[score -> gesture -> sound]

rather than:

[score -> sound -> gesture]

While this dichotomy is far too simplistic (in the practice of music, these perspectives mix) it does represent two kinds of perspectives of music reading, perspectives that lead to markedly different sounding results. These different perspectives are also reflected in the practice process - does the pianist aim to execute the score based on its interpretation as a sequence of symbols representing sounds, or does he aim for an embodied understanding of it³¹? That pianists disagree over whether these expressive markings *should* be read as embodied meanings can be indicated by a simple test. Ask several pianists the question: what does legato mean? A certain percentage will respond with a formal definition that comes from a conceptual understanding of the word (much like a dictionary definition) while others will respond with some kind of description of gesture. In the latter category, many will convey this gestural information below the level of words - they will enact or mimic the gestural meaning of legato with their hands as they talk. Thus some will tend to think at the level of the rule or instruction - at a verbal or symbolic level - while others might tend to think of legato as an embodied experience, an understanding which bridges the gulf between the instruction (notation) and its performance. In both cases, the pianists' pre-reflective apprehension of the score involves

³¹ In support of the distinction between interpretation and understanding, consider the following paragraph from Leman: "Corporeal intentionality can be distinguished from cerebral intentionality - which, in music, explores the speculative pursuit of potential interpretations. The essence of cerebral intentionality is interpreting the source of intentions attributed to music. The essence of corporeal intentionality is the articulation of moving sonic forms, the emphasis on movement in relation to behavioural resonances of the human body. Corporeal intentionality can be seen as an emerging effect of the coupling of action and perception. If action and perception are indeed tightly coupled (probably due to overlapping neuronal codes), then it should be possible to derive action sequences from perception in order to see how intentionality is reflected in the action sequences" (Leman 2008: 84-85).

activation of the aforementioned neuronal action pathways, so the difference between the two attitudes amounts to whether a conscious ratification of this underlying perception-action coupling takes place and whether this activation is allowed to be expressed through overt action.

In performance theory, such differences in the translation of notation have been recognised. For example, in his book *Musical Performance*, music theorist Guerino Mazzola writes:

Performance can now be defined as a transformation of the mental level of the score into a set of sounding/physical events, and this is the type of performance we want to deal with in this book. It is crucial to understand this concept as excluding other types of performance not because they are not relevant, but because the chosen type is the perspective that has undergone the most intense and elaborate scientific investigations as revealed in our historical sketch. However, performance involves all [ontological] dimensions of music. Above all, the intermediate gestural realization of score symbols, their “thawing to gestures” that act on the instrumental interface and thus generate sounds, plays a major role, but this is — unfortunately — not yet a relevant topic of performance theory. (Mazzola 2010: 28)

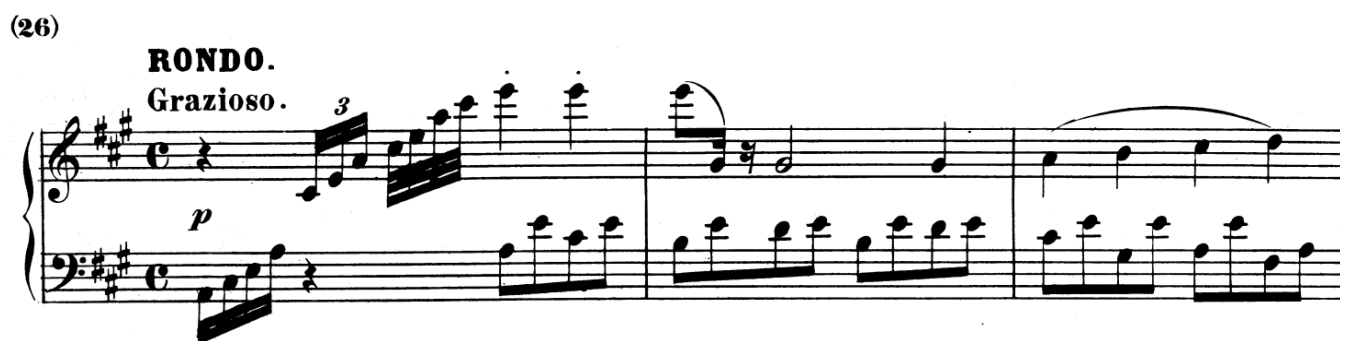
It could be noted, at this moment, that early neumatic music notation was more or less the visual representation of gestures - it had a spatial quality. Tablature notation is also an indication first of where to put the fingers - which is a gesture then translated into sound. Staff notation has come to seem like abstract notation of pitches and rhythms, but in fact developed from or out of these early notations, and it can also be read through gesture.

So what could the transformation of score into gesture - “thawing to gestures”³² - look like? What elements of the score could be read as gestures, and by whom? In the

³² The word “thawing” is unfortunate since it suggests that gestures are frozen in the notation itself and that anyone thawing them might thaw the same gestures. On the contrary, the performer’s gestures are his means of reading the score, and each individual performer brings his own gestures to bear on the gestural

first place, gestures are not found in the score by an act of *interpretation*, but they are rather *understood* from the score through embodiment. Since they relate to the very specific embodied knowledge of how to play an instrument, they will be read differently by pianists than by theorists, musicologists or any other reader who does not play the piano, because of the difference in embodied knowledges. While a pianist responds to the sight of the score with pre-reflective activation of sensorimotor neural pathways reflecting the habitual action sequences employed in its execution, a non-pianist would not have a similar reaction. A pianist may choose to override or ignore such reaction through conscious activity.

Gesture, however, need not necessarily be specifically pianistic. Consider the opening ascending passage from the following excerpt:



Example 10.3: Beethoven Sonata op. 2 no. 2, Movement IV (Breitkopf, 1862

[Kalmus reprint 1933])

A literal *interpretation* from score to sound (like a computer play-back) would result in audible transitions between the speed of the opening sixteenth notes, the triplet sixteenth notes and the thirty-second notes. In gesture, this performance would feel discontinuous because the audible transitions would feel like subdivisions. However if this

affordances presented by the notation. Because the difference in body schemata between individual performers meaningfully affects what gestures they see in the score, it pays to be very clear about this point.

is to be *understood* from an embodied perspective, it is a kind of notation of one sweeping upward gesture in which the notes at the bottom are slower than the notes at the top. In such an understanding, the distribution of notes is approximately similar to what is written but the transitions are smoothed so the acceleration is seamless. The charm of this swinging gesture gives the music its *grazioso* quality - a quality that is noticeably absent from a literal score to sound interpretation. While at the level of sound-producing gestures this is a pianistic understanding, there is a more general layer of gestural meaning - the sweeping *grazioso* quality - which reflects universal kinaesthetic experience.

The result of literal interpretation, then, is different from what results from an act of embodied understanding. The overarching goal in this dissertation is to show how this embodied understanding can be developed in the direction of polyphonic expression, and that a result of this changes the both how the performer reads the score and the sounding musical result. One's appraisal of this aspect of score-reading is dependent on the quality of one's embodied knowledge of the instrument, as well as one's body schemata in general. Even a theorist or musicologist who is sympathetic to the idea cannot access this knowledge very easily - it takes years to learn to play the piano, and among professional pianists the level of ability varies widely - and it is precisely this adjustment to the instrument that is necessary. Though it is high, this hurdle is not insurmountable: anyone who really wants can study the piano for however many years it takes with a good teacher and thus learn one of the varying traditions of how to view notation pianistically, and how embodiment colours their reading. They are thus instilled with a culture of pianism - a tradition of how to understand the music, and this tradition is the principal content of a performance - a content that is then further shaped by pre-reflective reaction to the affordances of the notated musical score.

It is unsurprising, then, that pianists often speak of “schools” of piano playing such as the “Russian school” or the school of “Viennese finger technique.” Similarities of touch can be noticed among students of a particular teacher, for example, and these “family trees” of study are of great interest. While these traditions comprise many facets - cultural/historical understanding, stories, ethics, ideals - the primary content is the embodied knowledge - which is at once practical and aesthetic - of how the piano is played, and thus the embodied knowledge of how to read the score. When a pianist speaks of the “Russian sound” he speaks not of sound waves, but of a certain kind of touch and a certain attitude towards music. That touch, in fact, could sound quite different from one instrument to the next, but it remains recognisable.

While “faithfulness to the score” is a predominant orientation in pedagogical settings, it should be noted that in music making the score never comes first. Scores did not precede music making in history and they do not proceed music making in the development of young musicians. The desire to make music, perhaps the special feeling expected of a certain concert, the acoustical and instrumental qualities available, the pianist’s own capabilities and many other given factors precede and condition even the choice of what repertoire to play. The order mentioned above:

[score -> gesture -> sound]

could better be filled out from the performer’s perspective as:

[motivation + feeling + embodied knowledge + tradition -> score -> gesture -> sound]

Similarly, the perspective of the composer does not begin with the score. It is only in the relatively more cerebral world of musicology, music philosophy and music theory that engagement with music often begins with a specific score, and this abstraction of the score from its embeddedness in musical practice both compounds the ontological

difficulties of defining a musical work and confounds attempts to make conclusions about musical performance since those conclusions will easily be taken as pertaining to the corresponding musical score or else as pertaining to its imaginary “ideal” performance which, in Rosen’s definition of a musical work, is not the simple sum of all performances but “the limit to which all performances tend” (Rosen 2001: 10).

A score is like a set of instructions or rules. As philosopher Ludwig Wittgenstein points out, there is an unbridgeable gulf between rules and their execution if rules must be interpreted, since every such interpretation must again be interpreted, leading to a regress. In his words, “any interpretation still hangs in the air along with what it interprets, and cannot give it any support. Interpretations by themselves do not determine meaning” (Wittgenstein 2009: §198a). As he points out, “This was our paradox: no course of action could be determined by a rule, because any course of action can be made out to accord with the rule” (Wittgenstein 2009: §201a). His solution to this problem is to reject the notion that rules are sounds or ink-marks on the page that need interpretation, but rather to argue that we have a feeling in actual cases for what goes against or follows the rules. The only reason we would be confronted with the problem of having to interpret the rules or instructions is when we take them out of their context in the “weave of life.” When we approach the rules with our own experiences in this weave of life, we can *understand* them directly without having to *interpret* them. As philosopher John McDowell (1984) points out in explaining this theme from Wittgenstein, we understand rules or instructions because we are inculcated in a practice or custom. This aspect of Wittgenstein’s thought rhymes with his view of the meaning of language as being determined by how it is used (“language games”) rather than what it represents. Applying this to music would mean that rather than seeing scores as ink-marks in need of

interpretation, we make sense of them within our own artistic practices, which in turn give the scores meaning.

To demonstrate this, I will now focus on a few examples of how scores present gestural affordances when taken within this context of practise. This practice is of course my practice, and other pianists, especially with different training, will read the scores slightly differently. These gestural affordances do not require interpretive justification, in the sense that they simply rise into awareness when the score is performed at the instrument, beginning pre-reflectively and transformed through kinaesthetic experience into objects for reflection. On the contrary, interpretation can override these understandings, and “literal readings” based on dictionary knowledge of the features involved lead to a much more conceptual but musically impoverished result. I will present four examples of gestural reading of scores: fingering, the staccato dot, tenuto and visual shapes.

10.2.1 Fingering

One clear way that scores represent gestural affordance is through fingering. If fingering has an influence on the embodied continuity of gesture in playing, then it has influence on the musical outcome in a performance. It seems that in the twentieth century, fingering was viewed by music publishers as a means to the end of simply getting out the notes. This view was reflected in the decision to grant editors freedom to add and change fingerings to new editions of works. While a tendency towards “urtext” editions led to self restraint in changing or adding expressive markings, editors continued to add fingerings as if the fingerings were neutral to expressive content - editors who were not always good pianists. It was thought that if a fingering worked, it was good enough.

Nothing could be farther from the truth. In the first place, obeying a written fingering overrides the natural bottom-up gestural response to the music that would otherwise happen pre-reflectively. If the sensorimotor system is activated when musicians see a score, the embodied patterns that come up naturally should be tried first, and only modified if there is a problem. This has the advantage that the musicality of a rich sensorimotor engagement with the passage is allowed to determine the fingering. Also, the fingering is thus customised to the individual hands of the player and to his specific embodied knowledge of how to play.

Fingering, when undertaken as a conceptual task, can also include faulty premises. One common faulty premise, as I have mentioned, is that the fingering itself is purely technical and does not have musical meaning. Other premises are certain conceptual rules, which may have their use in some cases, but which are applied without discrimination. Examples include the principle of no thumb on black notes, or the idea that the fingering should always be maximally legato. The fingerings of certain editors (Hans-Martin Theopold for the Henle editions is one example, or the editors of Example 10.4 below) are musically problematic. In Example 10.4 below (taken from the Edition Peters Urtext), notice that the editor does not generally group fingerings in sympathy with the rhythm or contour of the music, but rather tries to make legato fingerings at all cost. These fingerings are unmusical in the sense that avoiding the appropriate (and clearly notated) grouping articulations results in gestures that segment the music in highly unmusical ways, placing small but significant strain on the hand while seeming to try to connect everything as much as possible with contiguous fingers. In this case, such a “connect-everything” approach even includes a black key to white key slide (in the second measure shown in Example 10.4).



Example 10.4: Mozart Sonata in E-flat K. 282, Movement I (Peters Urtext, Martienssen & Wiesman, ca. 1938)

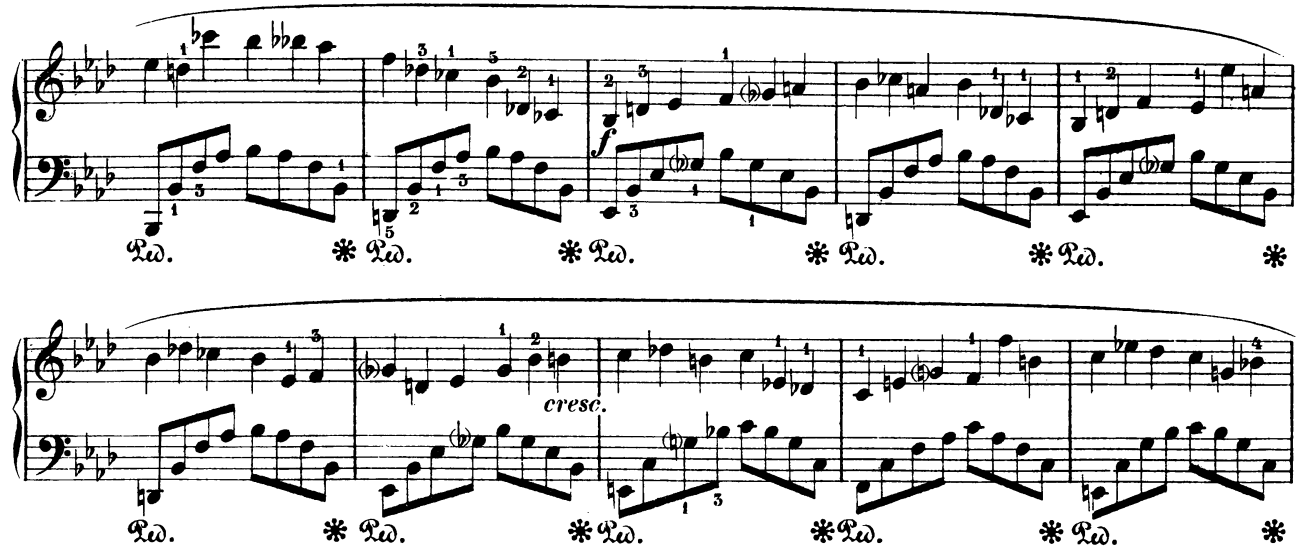
The thumb is used on the last sixteenth note in the first right-hand slur of the second bar in Example 10.4, in order to connect this note to the next one. Of course this connection is quite superfluous since the structure of slurs clearly indicates an articulation between the groups of notes. Worse, the thumb is quite a heavy to use on the last note of this group, a note that really should be light. As piano pedagogue Edna Golandsky (2003) explains, the thumb often plays as a unit with the arm in rotation since independent downwards movement of the thumb (that is without the help of rotation) uses the abduction/adduction muscles around the thumb - muscles which are slow and generally unsuitable for taking the key drop in its entirety. The thumb, either played by rotation as a unit with the arm or played independently, is heavy, and care has to be taken to avoid causing an unwanted accent. In summary, this fingering can work, and it is not difficult to execute, but it is not aligned with the phrasing marked by Mozart, and even though a pianist *can* make it sound good, a better fingering would be immediately in alignment with the movement of the music, in this case honouring the segmentation notated by Mozart's slurs as well as the rhythmic gesture. This overlap between musical and technical gesture

would result from a bottom-up process beginning with the gesture rather than with a conceptual calculation of fingering.

The fingering discussed above contains gestural information in the context of the artistic practice of a pianist, just as much as the contours of notes contain gestural information in this practice. In this case, the fingering added is ill-considered since the gestural information the fingering suggests is at odds with both the rhythm and the phrasing of the music as notated by Mozart. If the notation of Mozart is understood gesturally, or from the perspective of how to group the notes (shown with slurs,) then this fingering clearly goes against that instruction. It is perhaps considered by the publisher/editor to be a “sufficient” or perhaps even “efficient” fingering. Underlying this attitude toward fingering is again the idea of separation between musicality and technique - a reflection of the Cartesian divide between mind and body.

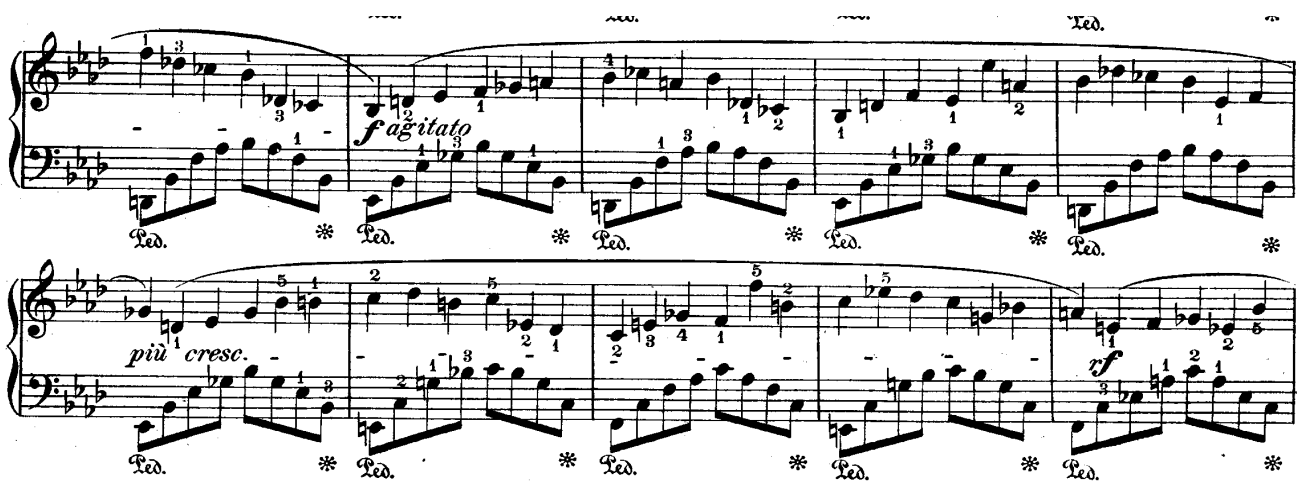
There are many editions, on the other hand, that contain very musical fingerings, which cause the hands to move in sympathy with the music. Schnabel’s Beethoven, Gieseeking’s Schubert, Cortot’s Chopin - in these examples the pianistic mastery can be understood simply by trying the fingerings. Editions such as Arrau’s Beethoven Sonatas and E. Robert Schmitz’s Chopin Etudes explore alternative embodiments through systematised experimentation with fingering. In all these cases, the gestural and musical meaning of the fingering overlaps.

Pianist-composers, too, have a musical-expressive view of fingering. Consider this example of Chopin, a passage from the *Nouvelle Etude* in F minor:



Example 10.5: Chopin Nouvelle Etude in F minor op. Posth. (Breitkopf, Reinecke, 1879)

The repetition of the same finger (1-1-1 at the end of the fourth measure and again in the parallel passage of the second line) activates a pulse of the arm for each of those notes and serves as a kind of emphasis. It is neither the first fingering that would come to mind in that passage nor is it the most efficient fingering. If fingering is considered as simply a means by which to get out the notes, then this specific Chopin fingering must be corrected, as it is in this edition:



Example 10.6: Chopin Nouvelle Etude in F minor op. Posth. (Bote & Bock, Klindworth, 1880)

And in this edition:

Example 10.7: Chopin Nouvelle Etude in F minor op. Posth. (Schlesinger, Kullak, 1883)

However, the choice of fingering by Chopin is absolutely significant and most certainly influences both the gesture of how the notes are embodied and their sounding result. It cannot be considered a mere technical solution, but it is rather a musically significant part of the score.

It might be added, on the other hand, that practicing alternative fingerings gives rise to alternative experiences of the music. For passages that have no marked fingering, or for composers who were not great pianists, this process allows for a consideration of different embodiments and expressions. If I play the left hand part of a piece with the right hand, a common practice technique that involves alternate fingering, the expression might be different since the embodiment from the playing perspective influences how I hear the passage from a listening perspective, which in turn influences the imaginative perspective of how I hear or feel the music. When I return to playing the left hand part with just my left hand, I can re-use that imaginative experience - my imagination has been thus

enhanced by the alternative embodiment in a way that simply *imagining* playing the left hand part with the right hand cannot accomplish with as much immediacy. If the music has a different feeling of gesture, I can use that from the imaginative perspective in a normal performance. I don't have to consciously call forth the memory of playing with the wrong hand in order for it to affect the normal performance - its trace is sedimented deeply in my unconscious apprehension of the music and thus opens new dimension in my imagination.³³

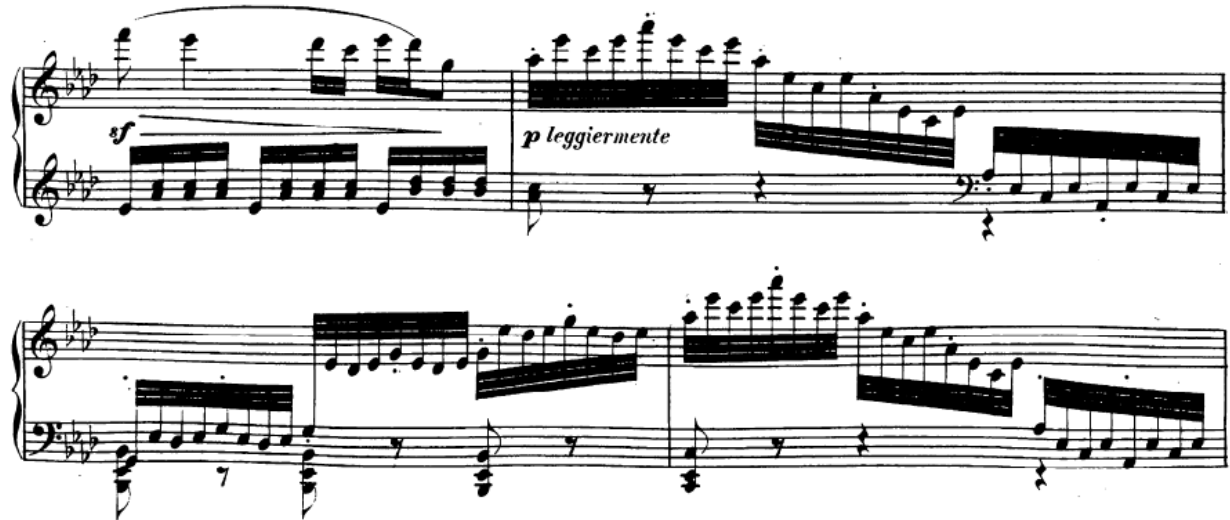
10.2.2 The Staccato Dot

Many composers made a special use of the staccato dot. Staccato, by the definition of Merriam-Webster, means "short and not sounding connected."³⁴ In the special use to which I am referring, the staccato dots seem to represent a physical gesture rather than a realisation in sound of the definition of the word. It must be recognised that staccato, even taken with the dictionary definition, can be taken to signify the kind of attack as well as the length of the note (similar in this sense to the word articulation, which points to a specific musical meaning as well as body movement). However, the variability of the meaning of the staccato dot depends on its context, particularly with respect to the embodied feel of its surrounding texture and its placement in metrical structure. In the following examples, I will examine staccato dots placed on metrically strong beats and discuss their embodied meaning.

³³ An extended example of this technique can be found in this masterclass of Arie Vardi: <https://www.youtube.com/watch?v=B9URWzTvpec>

³⁴ Accessed from Merriam-Webster online <

10.2.2.1 Example 1: Beethoven Sonata in A-flat op. 110



Example 10.8: Beethoven Sonata in A-flat op. 110, Movement I (Breitkopf, Brahms, 1862)

What these dots actually mean can only be answered from a broad understanding of Beethoven's works. He consistently uses this notation throughout his piano compositions in passages which would sound obviously uneven and unmusical if interpreted in what pianist and pedagogue Abby Whiteside (1997) would call a "note-wise" or sequential way – that is by simply playing the staccato note shorter in contrast to its surrounding notes. Indeed the experience of playing this passage *leggiermente* as it is marked results in a separate articulation of the wrist over every four-note group, not a separate articulation of one note separated from its surroundings. When played this way, the passage, which might otherwise be difficult to control, becomes comfortable and seems to almost play itself. It is when read as a gesture that the notation makes the most sense. It is true that the modern piano is so different from Beethoven's that what makes sense on the modern piano might be somewhat different from what made sense on his piano, but this just reflects the fact that the reading of the score is embedded in musical practice which changes historically, and which is itself contextualised by the instrument.

In my understanding of this Beethoven example, each staccato dot on every group of four thirty-second notes indicates a separate movement of the forearm (which results in an articulation of the wrist). Many other composers make a similar use of the staccato dot to indicate a separate gesture of the arm. In these cases, reading the staccato as a “short note” can easily result in an interpretation that is jumpy, erratic and unmusical.

10.2.2.2 Example 2: *Bach French Overture BWV 831*

In this example from Bach’s French Overture, we see an early example of the use of the staccato dot. Look at this example of the first edition:



Example 10.9: Bach French Overture in B minor BWV 831 (First edition: Weigel, 1735)

Notice again the fact that the dot is placed on the strong beats, and that the same note that has a staccato dot seems to *also* be included in the slur. As Albert Schweitzer notices: “The Bach staccato only rarely coincides with our modern staccato. Its effect is not so much a key pizzicato as the short and heavy stroke of a bow. Its effect is therefore to accentuate the note rather than lighten it.” (Schweitzer 1911: 370). The analogy with bowing of a string instrument is particularly apt, since such a gesture over the timescale of the slur can be considered a parallel to the gesture of coarticulation on the piano.

In modern editions, an understanding of legato and staccato as a dichotomy, and the reading of such a concept onto these scores, results in corrections of the notation. In the Bärenreiter edition of the passage above, the slurs are corrected to include only the notes *after* the dot, presumably because the editor thought that the notes had to be either staccato (with a dot) *or* legato (with a slur) but could not be both at once. This correction seems to reflect the sequential understanding of a staccato dot - that it applies to one note, and that it means that the note in question is short - an understanding which has changed over time. Again in this case, an embodied reading similar to the reading of Beethoven op. 110 (above) seems to make the most musical sense. With this reading, there is no contradiction between the slur and the dot as notated in the first edition.



Example 10.10: Bach French Overture in B minor BWV 831 (Bärenreiter)

10.2.2.3 Example 3: Schubert: Impromptu op. 120 no. 3

In this example from Schubert (the Impromptu op. 120 no. 3) Schubert seems to tell the pianist not to try to connect the bass note with the supporting figuration in the left hand. Doing so opens the hand to a stretch which results in some small degree of tension across the back of the hand and in the wrist, all of which does not represent a

technical difficulty, and might be considered by some to be inconsequential, but does not lead to the perfect control and suppleness that characterise the execution of this texture with a freely separate gesture for the bass note. In this case, the dot does have an effect on the sounding result, but it is not the effect of making the note shorter. In fact, separating the bass note freely combined with an expert use of the pedal makes the sounding result more controlled, supple and maybe even smoother. Thus the meaning of the dot - the separation that it implies - is a *pianistic* meaning that must be translated by the performing body of the pianist into sound. It does not mean a separation in sound, but a separation in gesture. When I play this passage, I feel that the gesture that plays this bass note originates in the arm and is mediated by a supple wrist. This may result in a slight emphasis on the bass notes in comparison to the slurred notes that follow.

Examples can be found of pianists who play such staccato dots in Schubert with a literal interpretation of “short note.” However, I have yet to find a recording of the above passage of the above impromptu played with this kind of literal staccato dot, presumably because even the most scrupulously literal and cerebral pianist would find it to sound ridiculous. In other works, however, this kind of interpretation can be found. If this embodied way of reading is more or less the only viable option in the impromptu example, should a similar embodied reading be preferred in other examples where the alternative literal reading might be aesthetically viable? While I didn’t find a recording representing the “short note” interpretation of the staccato dot in the B-flat impromptu, the Andantino from the A Major Sonata D. 959 (Example 10.11) represents an example for which there are recordings that represent a whole range of readings ranging from “extremely short note” (William Grant Nabore)³⁵ to “moderately short note” (Mitsuko Uchida³⁶) to “short

³⁵ <https://www.youtube.com/watch?v=qSjQnIYXb7A> (Accessed 2/2/2016)

³⁶ <https://www.youtube.com/watch?v=98MZpEBbJrU> (Accessed 2/2/2016)

note but then sometimes with pedal” (Alfred Brendel³⁷) to “consistent pedal” (Rudolf Serkin³⁸). Of course this is a question of individual preference, though I would argue that the embodied reading is no less faithful to the score than the literal reading. In practice, as I mentioned at the outset, the two perspectives can mix, and it is not my purpose here to argue one way or the other, but rather only to suggest that the dot can be read as indicating a certain kind of gesture.



Example 10.11: Schubert Sonata in A major D. 959, Movement II (Epstein, Breitkopf, 1888)

10.2.3 *Tenuto*

Another example of a notation that seems to have a strong embodied meaning is the use of tenuto in Rachmaninoff. The word tenuto itself - translated as “held” - suggests a kind of gesture. The instruction might suggest that the performer should hold the note longer, or perhaps that a performer should emphasise a note (there are examples in Rachmaninoff where every note of a melody has a tenuto mark, which seems to simply indicate that it should be brought out). Again, its meaning depends on its context, and in this case Rachmaninoff seems to use the tenuto to mark shapes of the arms whereby the weight of the arm - though spread over groups of notes - lands most markedly on the notes with tenuto. These are the kind of “goal notes” (Whiteside 1997) that express a level of

³⁷ <https://www.youtube.com/watch?v=Il6-lZYDpqY> (Accessed 2/2/2016)

³⁸ <https://www.youtube.com/watch?v=mQ0abGf69v8> (Accessed 2/2/2016)

structure that hierarchically nests within the structure expressed by the slurs. The spreading of this weight of the arm (the coalescing of notes to form groups) is notated by the slurs and the diminuendo marking for each group. In this example it seems that translating from the score directly to sound would in any case lead to a similar embodied understanding of these phrases. However, if that physical understanding is consciously suppressed, or if the elements in the notation (tenuto, slur, diminuendo) are taken separately, the sonic outcome would be far from satisfactory. Indeed, then, the body is a necessary mediator between score and sound in order for this passage to be played with understanding.



Example 10.12: Rachmaninoff Concerto no. 3 in D minor op. 30 (First edition: Gutheil, 1910)

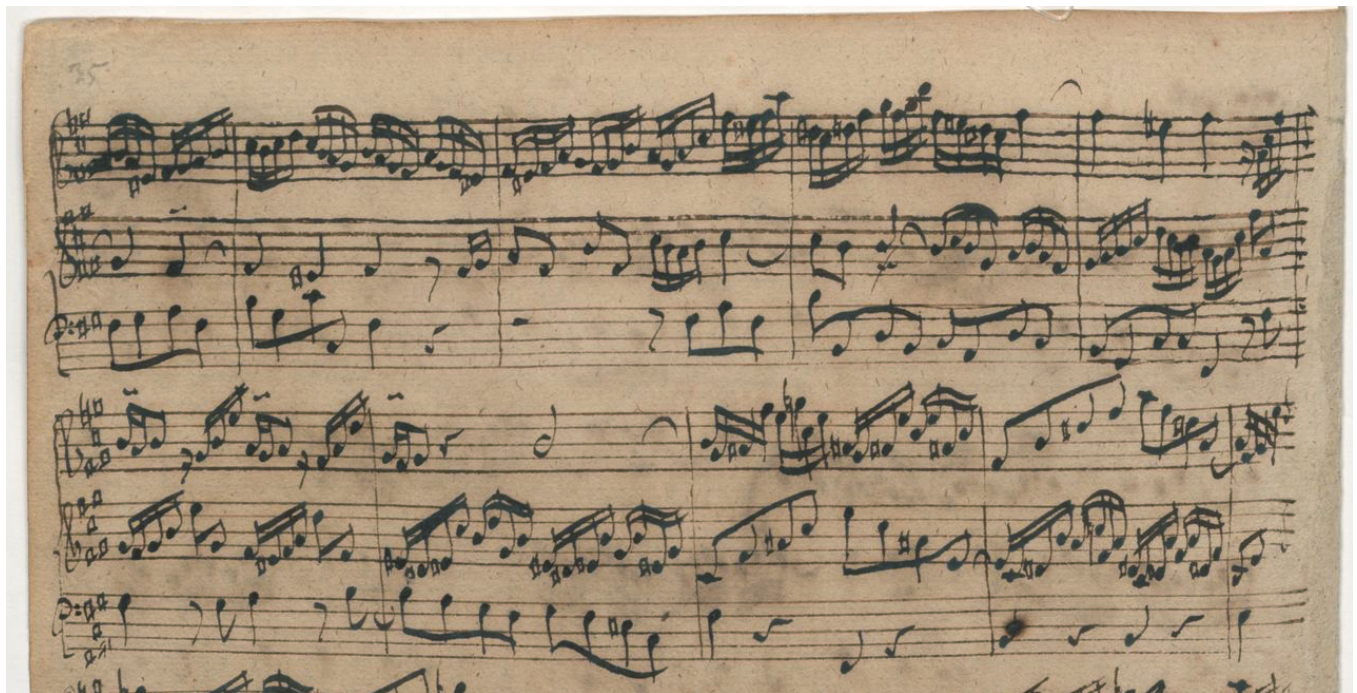
10.2.4 Visual shapes

Often manuscripts contain visual elements that can be understood as reinforcing a gestural understanding. To begin with, though the musical notation may look quite uncomplicated or uncontroversial and is quite easily legible, reading it is not straightforward. Comparing “mainstream” performers and historically specialists, musicologist Colin Booth writes:

The difference lies in the fact that specialists, alongside the use of rediscovered instruments and techniques, will at least recognise that notation in early music may look familiar, but that its interpretation is a very different discipline from that required when playing Shostakovich. So it can be they, who, by discovering a

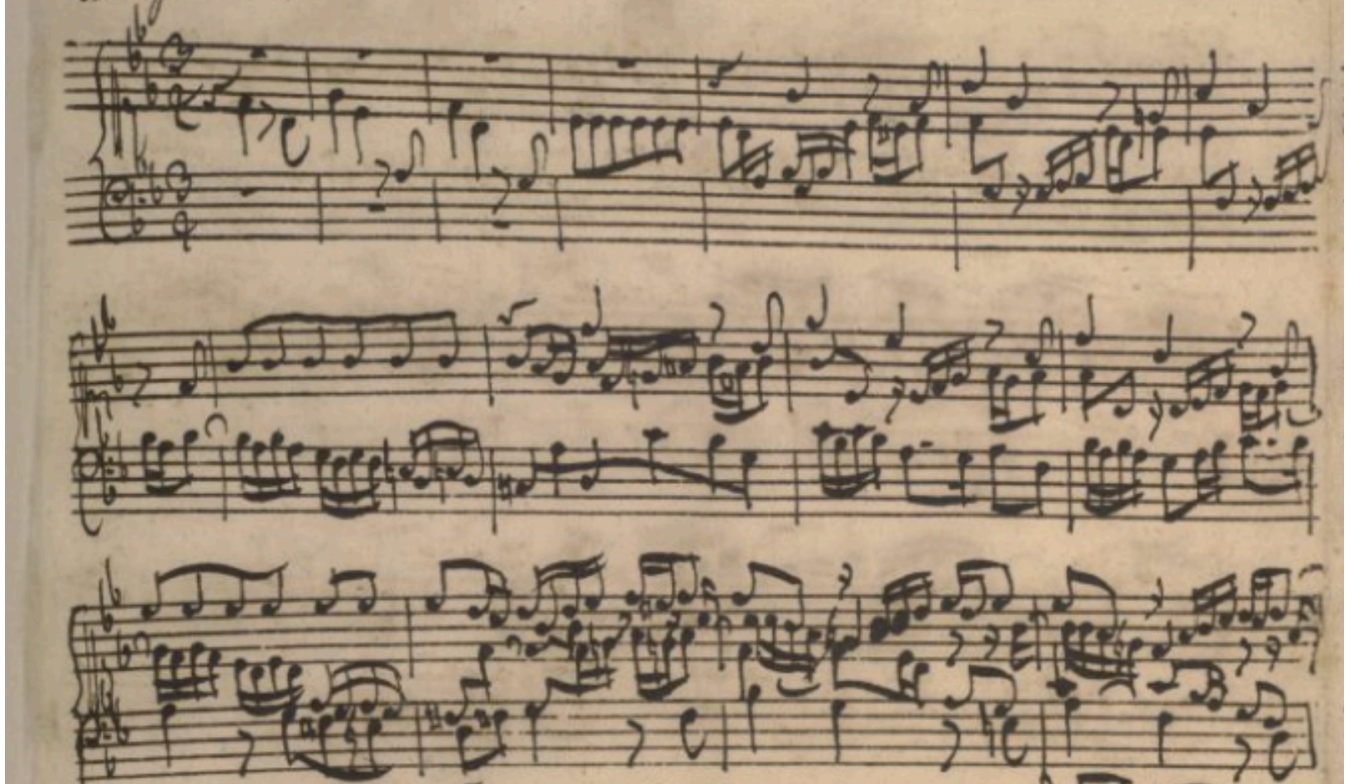
different set of possibilities within the score (possibilities based on research into performance practice contemporary with the composition), may enjoy a freedom at least equally great, arguably less egocentric, and of a rather different kind. (Booth 2010, Introduction)

In the case of Bach's manuscripts, it seems that Bach tried to visually encourage a gestural interpretation. What is immediately noticeable is the expressive shaping of the beams connecting the sixteenth notes and eighth notes that seem to dance off the page. These shapes most often follow the contours of the notes (as musical gesture often does) but some are more curved and some are straighter, seemingly expressing the degree to which the contours of the notes can be inflected with gesture. Notice, for example, that some examples are straight even when the notes curve:



Example 10.13: Bach Trio on Allein Gott in der Höh sei Ehr (composer's manuscript)

In the following example the beams of groups of repeated notes are themselves curved, and notice the altered beaming of the repeated notes in the soprano on the third line:



Example 10.14: Bach Fugue in G Minor from *Das wohltemperiertes Klavier II*

(composer's manuscript)

Knowing that when a musician reads a score his sensorimotor system is unconsciously activated (Behmer & Jantzen 2011), it is not unreasonable to conclude that these shapes influence the unconscious gestural grip of the music. For a composer so visually precise and expressive (see monogram, Figure 10.1) it would stand to reason that these shaped beams contain visually expressive meaning beyond their symbolic function, and regardless of whether it was intended to do so, it can provide inspiration. Learning a Bach piece from the manuscript - seeing those curves repeatedly during the practice process - has at least an unconscious influence on the gestures used to embody the music.

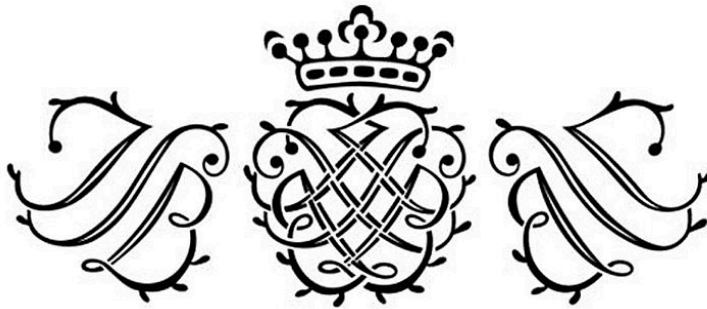


Figure 10.1: Bach Monogram

Whiteside argues for a visual-gestural connection early in the practicing process. In approaching a complex score of contemporary music, she advises the student to begin by just playing the shapes they see on the page (using random notes all over the piano). The student begins with the biggest gestures, following the largest contours of the music. Gradually the student is able to refine and add more details until all the notes are in place. What is notable is that the score is used as a visual artefact representing *physical gesture* in the first reading, and gradually the symbolic reading of the notes as pitches/rhythms is added (Whiteside 1997).

10.3 Abstraction and embodied knowledge

Do musical details and their notation in scores always represent an underlying gesture? Details are an abstraction of the bodily experience of musical gesture, an abstraction that can best be conceptualised with distance - distance between the details and their underlying gesture. This distance can be thought of as distance in time, imitation and abstraction and it can be very small, in the case of improvised music for example, or

very large, spanning centuries and various abstractions of notation. The distance of abstraction begins within the self - it is the distance between a feeling and its expression, between having an unconscious bodily experience, gradually becoming aware of it, expressing it, re-enacting or imitating the expression, glossing the expression with words, notating it. The distance of imitation can be thought of at any of these levels of abstraction - for example, one can imitate another's unconscious bodily movement, or reconstruct it based on their expression or gloss of expression or notation. One can also imitate one's own expression. The distance in time can be small within one person, for example the time between having a feeling and its musical or verbal expression, or it can be vast, such as the time between a composer's notation of a piece and its performance centuries later.

While details originated in gesture, they have become in some cases thematically disembodied in the twentieth century. The most extreme example of this is total serialism, where the rules by which discrete expressive details or parameters combine were conceptually formulated, making any consideration of the human perceptual system and how those details combine in felt experience subordinate to the system. Despite this bias towards the conceptual, some composers achieved lively and interesting results, and regardless it still remains the job of the performer to play the music in a way that excites the listener, and that is done not with mathematical, conceptual playing but with visceral and energetic engagement, even in total serialism.

11 Conclusion

If instrumental embodied knowledge is an integral part of reading scores, imaginative experience and making music, it follows that developing or modifying such embodied knowledge leads not only to different sounding results (see §8) and also leads to *seeing the scores differently*. In considering notation, I have given some examples of how I see gestural meaning, while holding that this way of reading the scores depends on the practice of the individual musician, which changes over time. Any similarity in the gestural meaning that two different musicians might see in the notation is a result of the fact that we have many formative experiences in common. Because of the structure of our body and its movements, musical gesture at the instrument is layered in sound-producing gestures and concurrent gestures that have a structure of their own at a completely pre-reflective level. This structure is a combination of the musculoskeletal structure of the body and the body schemata or habits of movement of the performer. In Part III I will explore this structure to show the continuum between sound-producing gestures at the periphery of the body and concurrent movements at the centre of the body, and how they are hierarchically related. This will form the basis for discussing polyphonic expression as embodied knowledge in Part IV.

Glossary for Part II

Affordance - the possibility of some action existing between an organism and its environment (Gibson 1979; see footnote to Introduction).

Body schemata - learned motor patterns, habits, or dispositions that require little mental effort to carry out (§5).

Extensional gesture - musical gesture that results in actual body movement in space (§9.2).

Framing - a conscious process used to separate or insulate a part of pre-reflective experience in order to protect it from being objectified by the conscious mind (§6.2).

Imagination perspective - the temporal perspective involving thinking ahead in performance whereby sounds are imagined *before* their execution (§9.6.1)

Intentional gesture - musical gesture that is imagined but not realised in body movement (§9.2).

Interpretation - the act of making conscious decisions in shaping a musical performance (§5).

Invisible body - a pathological form of self-consciousness where the body is “absent from experience” (§6.1, Legrand 2007).

Listening perspective - the temporal perspective involving the performer’s own perception after the notes have been played (§9.6.3).

Musical details - objectively measurable modulations of dynamics, timing, and articulation occurring on the sounding surface of the music (§10.1).

Opaque body - a form of self-consciousness where the body is “taken as an intentional object of consciousness” (§6.1, Legrand 2007).

Performative body - a form of self-consciousness characterised by a “pre-reflective experience of the body itself” (§6.1, Legrand 2007).

Playing perspective - the temporal perspective associated the actual moment of execution (§9.6.2).

Polyphonic expression - A performative texture characterised by simultaneous divergence in expression (§3). An example of divergence in expression is found in Example I.1. A more precise definition of polyphonic expression will be given in Part IV (§17.5).

Polyphony - a stylistic description of musical texture with counterpoint as a defining feature, characterised by its distinction from homophony (§2).

Timescale - a unit of musical time measured in the score, such as one beat or one measure.

Transparent body - a form of self-consciousness in which the body is apparent in the “pre-reflective bodily experience of the world” (§6.1, Legrand 2007).

Understanding - a non-conceptual and primarily pre-reflective embodied reaction, depending on the body schemata of the performer (§5).