PERFORMATIVE AGENCY IN ACOUSMATIC MUSIC

By

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A DISSERTATION PRESENTED TO THE GRADUATE SCHOOL
OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

UNIVERSITY OF FLORIDA

2012

To Maxwell and my parents

ACKNOWLEDGMENTS

I thank Dr. James Paul Sain for his support and guidance throughout my doctoral study and dissertation process. I also thank Dr. Paul Richards, Dr. Kevin Orr, and Prof. Ric Rose for their support and advice. I'm grateful to my parents and husband for all of their love.

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DEFINITION OF TERMS

Acousmatic	Listening to a sound without seeing the sources behind it.
Acousmatic music	Electroacoustic music that is composed for fixed media only and played through loudspeakers.
Action trajectory	Used by Godøy (1997), to denote a temporal-spatial domain providing both procedural proprioceptive and visual components.
Affordances	Coined by Gibson (1979), referring to the meaning or quality of an object that is selectively perceived depending on the perceiver's interest and need.
Corporeal interpretation	See Embodied resynthesis.
Ecological psychology	Gibson's approach to visual perception, based on the view that humans, as organisms in the ecological system, directly perceive meaning through interaction with their environment
Embodied music cognition	The study of music cognition that regards one's bodily experience in musical activities as constructing one's perceptual framework of music cognition.
Embodied resynthesis	Coined by Leman (2008), referring to the corporeal aspect of human perception, in which important aspects of the outer world, particularly music, would in fact be captured in terms of actions.
Exteroception	Perception of stimuli that are external to an organism.
Gestural-sonorous object	Coined by Godøy (2006), in order to emphasize the gestural quality represented in the features of a sound object.
Gestural surrogacy	Coined by Smalley (1996), referring to new types of gestures in acousmatic music that can be perceived as being related, either closely or remotely, to the basic sounding model (i.e., human voice and instruments).
Indicative field	Coined by Smalley (1996), referring to the references of sounds to the human experiences.

Indicative relationship	Coined by Smalley (1996), referring to the relationship between sounds and the human experiences.
Kinesthesia	The sensation of joint movement, either from internal forces (active) or external forces (passive).
Kinesphere	Coined by Laban (1963), referring to a mental construct of space that one is always aware of in the interaction with the environment and with others.
Multimodality	Referring to multimodal perceptions that occur simultaneously.
Music concrète	A genre of electroacoustic music, founded by Schaeffer, which utilizes recorded sounds as material for musical composition.
Musical gesture	The combination of both physical gesture and musical sound that represents the energetic shaping of motion through time, as suggested by Leman and Godøy (2010).
Musical imagery	1) The sound imagined in one's mind in the absence of its source, 2) the ability to imagine a musical imagery.
Performative gestures	A performer's gestures that play a critical part in transforming musical idea to expressive sounds in musical performances.
Proprioception	Perception of one's own body position and movement
Reduced listening	A manner of listening to sound objects, suggested by Schaeffer, which focuses only on the pure acoustic qualities of a sound while disregarding any physical references of the sound.
Semiotics	The study of signs and symbols, which allows the separation of a sign into a *signifier* (the object itself) and a *signified* (a possible meaning derived from the object).
Sound object	A brief fragment of recorded sound, which can be inspected thoroughly and sculpted for musical composition.

Spectromorphology	Coined by Smalley (1997), referring to sound spectra (*spectro-*) and the way they change and are shaped through time (*-morphology*).

Abstract of Dissertation Presented to the Graduate School
of the University of Florida in Partial Fulfillment of the
Requirements for the Degree of Doctor of Philosophy

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December 2012

Chair: James Paul Sain
Major: Music

The separation of sound from sight in acousmatic music means that there is an absence of a physical source and causation behind a sound. Nevertheless, listeners can conjure up an image of a performative agent who could be *playing* the work, which is implied by gestural components in acousmatic music. This is because humans perceive a strong link between sounds and physical body movements. In fact, performing, composing, and listening all involve a networked multimodal perceptual system that is strongly based on the human body. This study reveals how perception and musical experience can work together in listeners' minds, creating constructs of performative agency that guide their listening.

The study begins with a review of the traditional concept of acousmatic music based on Schaeffer's principles. It is shown, however, that the gestural components of sounds give rise to the sense of performative agency, as opposed to the assertion of early acousmatic composers such as Schaeffer. This study introduces the theory of embodied music cognition, which supports ideas about the importance of bodily movement in music perception, followed by an exploration of research that discusses the inseparable relationship between acousmatic music and the human body. After

establishing the link between sound and action in one's perception, this study continues to investigate the practice of embodiment that takes place in musical performance, focusing on a performer's gestures that are deeply engaged in creating musical expression and musical gestures. The definition and expressive quality of performative gestures are discussed to elucidate the idea of human quality in performative agency. An analysis is then presented of *PianoForte* by Yu-Chung Tseng through the embodied perspective to demonstrate how an imaginary performing agent is formed in listeners' minds and contributes to their understandings of the piece.

CHAPTER 1
INTRODUCTION TO ACOUSMATIC MUSIC AND THE SENSE OF PERFORMATIVE AGENCY

Introduction

Acousmatic music is directly projected to the listener without relying on a performer's visual and musical intervention. However, the listener's perception is deeply grounded in his or her physical experience of musical activities, constructing a meaning tied to the physicality of the human body. The listener may attempt to identify, or imagine, the physical sources and agents of the sounds while listening to acousmatic music. This chapter outlines the traditional theory of acousmatic music, in which a sound is perceived for its acoustic qualities only, while its visual, physical, or cultural reference is disregarded. Nevertheless, it is shown that the sense of performative agency emerges in the listener's mind based on the physical and emotional aspects of the sounds, which are inevitably implied.

The Tradition of Acousmatic Music

Acousmatic music originated from music concrète, which, developed by Pierre Schaeffer (1910 – 1995), utilizes recorded sounds as musical material. The development of recording technology in post war Europe made it possible to capture ephemeral sounds on a magnetic tape. The recorded sounds can be replayed, modified, and even adapted for musical compositions. Any recorded sound can be used for music concrète, just as any material such as fabric, metal, glass, etc. can be used for a collage. The term music concrète is derived from the view that regards a sound as a concrete object. Audio recording and processing technology paved the way for the use of extensive sound material in musical composition, ranging from the sound of a musical instrument or voice to sounds of industry, nature, or everyday life. Composers,

therefore, were able to manipulate the actual sounds instead of writing a score, and create the fixed performance of compositions without depending on a performer's musical interpretation and technical ability.

Phenomenology of Perception

Incorporating nontraditional sound and noise into a musical composition engendered the need for a new approach to sound and listening. Schaeffer's principles of acousmatic music listening are closely related to and supported by Edmund Husserl's phenomenological view of perception. From Husserl's view of a perceptual process, an object is identified by one's consciousness through the flux of information, focusing on the object's intrinsic quality rather than its factual reference:

> We start by taking an example. Keeping this table steadily in view as I go around it, changing my position in space all the time, I have continually the consciousness of the bodily presence out there of this one and self-same table, which in itself remains unchanged. But the perception of the table is one that changes continuously; it is a continuum of changing perceptions. I close my eyes. My other senses are inactive in relation to the table. I have now no perception of it. I open my eyes, and the perception returns. The perception? Let us be more accurate. Under no circumstance does it return to me individually as the same. Only the table is the same, known as identical through the synthetic consciousness which connects the new perception with the recollection… But the perception itself is what it is within the steady flow of consciousness, and is itself constantly in flux; the perceptual now is ever passing over into the adjacent consciousness of the just-past, a new now simultaneously gleams forth, and so on. The perceived thing in general, and all its parts, aspects, and phases … are necessarily transcendent to the perception. (as cited in Kane, 2007, p. 16)

The perception of an object is accomplished, not by only a glimpse, but through observations that produce a series of diverse perspectives of the object, which Husserl referred to as "adumbrations" (as cited in Kane, 2007, p. 16). The perceptual focus is placed on the reduction down to the object's intrinsic qualities (e.g., the shape, color, and material of the object made of a flat top and legs) from its physical or cultural

existence (e.g., a *table*). Since these adumbrations do not present a consistent image of an object, the subject needs to consciously grasp the essential quality that holds the various adumbrations together. Husserl argues, “the identity of the object is provided through an act of consciousness, a synthesizing together of the stream of adumbrations” (as cited in Kane, 2007, p. 16).

James Edie (1987) points out that for Husserl, the essential meaning of a perceived thing is “the eidetic,” not “the factual,” which is achieved by means of “reductions” (p. 5). Edie also argues, “concepts are not things or substances or forces at all; they are rather meanings or structures forged by the mind in its experience of things” (p.4). This view represents the idea of *intentionality*, which Edie explains as “(1) the ability of the mind to identify and hold before itself ‘objects’ which can be meant as *identically the same* through a multiplicity of different acts of consciousness, and (2) the active and selective operation of constituting objects for itself” (p. 8). The perceived object is an *intentional* object in the sense that the object becomes a correlate to derive the essence exceeding the object itself. “Being the correlate of an act of synthesis on my part, the intentional object is no longer bound to any particular spatio-temporal adumbration” (Kane, 2007, p. 17).

Sound Object and Reduced Listening

Schaeffer’s aesthetic of acousmatic music, emphasized with the concept of *sound object* and *reduced listening,* is in line with Husserl’s phenomenology: A sound is observed as an object and its essential meaning is revealed through a series of perceptions achieved through repetitive and progressive listening. The term sound object refers to a brief fragment of sonic material extracted from a recorded sound. Reduced listening, also known as *acousmatic listening,* is an objective listening manner

in which the properties of a sound object are investigated and sculpted for musical composition—hence it is a *musical object*. In reduced listening, a sound object is identified by its "sounding qualities" (Jensenius, 2007, p.11), reduced from the physical and cultural existence of its sounding source. Additionally, the focus of each listening shifts among the different acoustic parameters, therefore producing a rich perception of a sound object. Schaeffer argues the sound object is an *intentional* object in the sense that the sound object is recognized as a distinct concept, which is transcendent of its discrete perceptions and "identified as the same across a variety of acts of consciousness" (Kane, 2007, p. 17).

The focus of reduced listening is on the acoustic features of a sound object, while placing one's knowledge or experience related to the object's source out of one's focus. For example, a bird's chirping sound is to be perceived in terms of pitch, timbre, rhythm, and how they progress, while ignoring the type of bird (e.g., skylark or pigeon), its location (e.g., the seashore or the zoo), its purpose (e.g., mating or alarming), and so forth. Michel Chion also states that reduced listening disregards any non-auditory quality or signification related to a sound:

> attitude of listening which consists of listening to the sound for *itself*, as *sound object* abstracting its origin, real or imaginary, and the meaning of which it can be carrier. (as cited in Emmerson, 1998, p. 136)

In fact, it is logical to limit the listening focus on the sound itself since a sound object, achieved from a recorded sound, exists as disembodied from its physical origin. Marc Battier (2007) states, "Listening is then favoured by the absence of visual stimuli; it is concentrated, and perception converges - better than that, it is reduced to that pure listening" (p. 192). This aspect of reduced listening also derives from "the ancient acousmatic traditions of the Pythagoreans" (Kane, 2007, p. 17). The term *acousmatic*

denotes the aspect of listening in which any physical, therefore visual, existence behind a sound is disregarded (Kane, 2007; Cox & Warner, 2004). Basically, Pythagoras's pupils were only allowed to listen to a lecture without seeing their teacher, who was hidden behind a curtain. The pupils were not distracted by their teacher's visual presence; therefore they understood the lecture better, concentrating on only the lecture. Recognizing this identical listening environment between Pythagoras's lectures and sound objects, in which the visual source is absent, Schaeffer used the term acousmatic listening synonymously with reduced listening.

Performative Agency

Performative agency refers to the sensation in which musical sounds are perceived as being performed by a human performer. Recognizing the gestural quality in musical sounds, listeners can conjure up an image of a human body as an agent who could create these sounds. Rosemary Mountain (2001) argues, "the listener, if only subconsciously, imagines a plausible sound source (such as a human body) whose behaviour and characteristics could produce the musical gesture or component" (p. 279-280). Watt and Ash (1998) conducted experiments in which subjects were asked to choose the word that better described the music excerpt they just heard, out of two given words that were related to psychological aspects of people. The result of Watt and Ash's experiments supports the idea that "music is perceived as if it were a person making disclosure" (p. 14), therefore creating the sense of "a virtual person" (p. 18).

Depending on the type of sound, the sound can be perceived as resulting from a non-human agent. There are certainly those sounds whose gestures do not clearly sound human in origin. For example, a chirping sound is perceived as being generated by a bird, regardless of its gestural quality. It can be argued that the listener's tendency

to imagine a human body as a performative agent is related to the longtime tradition of musical performance. For thousands of years, musical performance has been the fundamental way in which musical meaning is expressed, communicated, and interpreted. A performer is perceived as the causal agent whose gestures create musical sounds. A human performer's physical properties and ability in musical performance have defined the scope of musical composition as well. Some of the verbal annotations in musical scores reflect the fact that a musical idea is communicated via a metaphor of the human's motion and emotion: *agitato* (agitated), *agile* (swiftly), *affannato* (anguished), *en pressant* (hurrying forward), *animato* (animated), *irato* (angrily), *amoroso* (loving), *spiritoso* (spiritedly), etc.

Although the sound of acousmatic music is abstracted from its causality, the gestural qualities of sounds can be perceived as representing, or resulting from, a human's bodily movements, therefore giving rise to the sense of a human agent who performs the sounds. Once a performative agent of music is perceived, the expressive qualities of musical features (e.g., gesture and timbre) and their deviational progressions can be attributed to the musical, emotional intention of a human. It is plausible to argue that the listener can conjure up the sense of performative agency regarding the causal and expressive aspects of sounds. While the causal aspect is perceived by the strong link between sound and causal action, the expressive intention perceived in a sound makes the perceived performing agent to be identifiable as a human body.

Causal Aspect

A sound can be perceived as resulting from physical actions of a human or non-human. Gary Kendall's (2010) remark reflects humans' intuitive perception of causal

agency: “in the everyday world, listeners identify agency with the cause of the changes of state associated with the event” (p. 67). Emmerson (1998) claims that it is inevitable for the listener to catch the gestural aspect of a sound despite their effort to focus only on its abstract qualities on the principle of reduced listening:

> It proves very difficult to hear sound only in terms of an appreciation of its shape and spectral properties as Schaeffer seemed to advocate. Just as a Pollock painting might address deep archetypes of form and feeling within our subconscious (even appearing to ‘represent’ them at times), so we listen to any sound conditioned by our primeval past and evolution. (Emmerson, 1998, p. 136)

Perceived gestures in a sound give rise to the sense of agency, a causal reference of a sound. Katharine Norman (2004) also illustrates that she, as the listener, is naturally captivated by the causal implication of sounds:

> I immediately recognize the kinds of things that might have produced those sounds. I feel that I know them. Nearly all the sounds imply actions. Someone or something ‘did’ these things. (Norman, 2004, p. 8)

Recognizing the action component of a sound, the listener attempts to envision an imaginary person playing the sound and the way his or her bodily movements interact with the sound. These questions concerning the sound’s origin are raised in the listener’s mind: who is making the sound, with what is he or she making the sound, and what type of action is involved in making the sound?

> Yes, there is somebody there; I can hear the trickling sounds of pebbles or shards of metal falling through her fingers onto a surface and in particular, towards the end of the piece, there’s the sound of her slowly swirling a hand about in a container full of densely-packed grains – or perhaps rice, or tiny pebbles, or even sand. (Norman, 2004, p. 9)

It is remarkable that a listener can create the corporeal interpretation of sounds that, in turn, could reveal the sounds’ origin and causality. It is all the more striking when one

considers that acousmatic music, being transmitted by loudspeakers, is based on the absence of any physical and visual sensations related to the sounds.

Expressive Aspect

A human body can be perceived as creating a sound with expressive, emotional, and musical intentions. Musical sounds involve a wide range of refined expressions that can be attributed only to a person's emotional quality. The term *emotion* is used to denote a psychological state, as Anthony Newcomb (1997) illustrates:

> I should qualify here the adjective "emotional." Often when used in music-aesthetical discussion, it means "emotional states" (e.g., "sad," even the more complex "melancholy"). But I am using it here in another, uncontroversial meaning: the tendency to certain kinds of behavior over time (as in irritability, excitability, fearfulness, volatility, aggressivity, passiveness, confidence, and so on) - even an evolving pattern of emotional or psychological states over time (for example, growing confidence). (Newcomb, 1997, p. 142)

The sense of human agency is differentiated from the natural or machinery causes (e.g,. the wind causing a tree to sway or a coffee maker causing the water to drip) by the emotional and expressive quality in the resulting gesture or sound. The emotional quality that gives rise to the sense of performative agency can be elucidated by a comparison between two electroacoustic compositions, *Idle Chatter* by Paul Lansky and *Out of Breath* by Paul Koonce. Both pieces employ sounds directly produced from the human body (i.e., the voice in *Idle Chatter* and the breath in *Out of Breath*) therefore providing the immediate sensation of a human body. However, their compositional approaches to the sound source represent two contrasting ways of *performance* - an algorithmic processing of a human voice (*Idle Chatter*) and a reproduction of a human performance with an emphasis on the performer's psychological aspect (*Out of Breath*).

Idle Chatter employs brief phonemic fragments as sound sources. The use of voice strongly implies a human body as the piece's soundworld and, therefore, even the most passive listener cannot fail to recognize the virtual human presence. The vocal sound is synthesized and performed by an algorithm designed by the composer utilizing Linear Prediction Coding, granular synthesis, and spatial distribution. This is a unique reading or performance of the sound and, at the same time, is entirely divorced from both the physical and emotional aspects of a living human being. The diversely processed vocal sounds are layered to create a virtual chorus that is continuously present in the background, contrasting with a person's performing capability.

In contrast to *Idle Chatter, Out of Breath* brings the concept of an embodied musical practice into the core of the piece; a performer's body and mind are brought together in order to achieve the desired sound quality. This piece employs three sound sources: breath, flute sounds, and airy noises around the embouchure. For an untrained listener, this piece may sound like endless repetitions of a single note. However, an attentive listener will be able to recognize the person in the music who is highly concentrating on playing the flute and creating slight or radical changes in the timbre. Without creating any complexity of texture, pitch, or gesture, *Out of Breath* establishes the clear picture of a performer engaged in musical practice, therefore allowing a listener to focus exclusively on the performer's intention with the sound and even breathe along with the performer in this virtual performance.

Out of Breath represents a psychological aspect of a human performer, who is striving to create an expressive sound and struggling at every moment for the perfection of the performance. A strong sense of performative agency emerges as the piece

unfolds. The piece gradually reveals the interactive relationship between the performer and the sound, in which the sound not only results from the performer's effort but also influences his or her perception and adjustment for the next play, such as air pressure, angle of air stream, vibrato, etc. The performer's psychological state is also reflected in various details. For example, the performer's anxiety about failure while struggling to create the ideal sound is implied by the unsteadiness or imperfection of spectral structure, vibrato rate, breathing pace, and pitch production. In addition, the amplified sounds of breath and airy noise, which are rarely audible for a listener in reality, are sounds that only the performer can perceive during a performance, therefore bringing forward a performer's perspective to a listener's attention.

A Way of Listening Employing an Imaginary Performer

Schaeffer's reduced listening encourages listeners to separate a sound from its physical origin and focus only on the sound itself: its pure acoustic quality. Acousmatic music is composed of sounds whose source and cause can be unclear or unidentifiable. The connection between a sound and its source becomes even more ambiguous as the sound is adjusted and arranged with other sounds in musical composition. The various manipulating techniques, such as looping, pitch transposition, time compression, etc., modify the sound's characteristics, therefore obscuring its identity. Also, the presentation of multiple sounds can create varying texture, which can be perceived as a cluster of abstract sounds rather than an individual sound. The features of acousmatic sounds, such as timbre, pitch, intensity, and their dynamic progressions, are quite abstract and distanced from physical origin. However, listeners may intuitively seek the cause of a sound and conjure up the image of a performative agent whose actions could have created the sound and its gesture. The principle of reduced listening is

challenged by this natural tendency of listeners to identify even a slight connection between a sound and the physical causation behind the sound. In fact, Schaeffer himself distinguished the four listening modes available to listeners, including reduced listening, and he admitted that a listener could adapt other ways of listening:

> Nothing can prevent a listener from making it waver, passing unconsciously from one system to another, or from a reduced listening to a listening which is not. One can even be pleased with that. It is by such a swirl of intentions that the connections are established, that information is exchanged. (as cited in Godøy, 2006, p. 151)

Acknowledging the listener's tendency and ability to identify the connection between the gestures of sounds and a human body's movements, it can be argued that the listener can intentionally employ an imaginary human performer for understanding acousmatic sounds. Further, depending on the listener's musical experience and expertise, the listener can perceive the expressive quality of sounds and gestures as resulting from the imaginary performer's musical and emotional intention. This way of listening can provide a link between the tradition of musical performance and the disembodied listening environment of acousmatic music. In addition, those listeners who are musically trained but are not familiar with acousmatic music can benefit from this way of listening by engaging their experience of musical performance with acousmatic music listening.

Preview of Chapters

Chapter 2 reviews the *embodied paradigm*, which takes one's bodily experience as the critical basis of human perception. The concept of embodied music cognition, in which the strong link between action and perception is emphasized, supports the causal aspect of performative agency. It is revealed that one conjures up the image of a human body as the causal agent of sounds, based on one's multimodal experience of musical

activity. From the viewpoint of the embodied music cognition, the principle of acousmatic music is re-evaluated and a flexible listening method for acousmatic music is embraced, in which listeners are encouraged to actively and creatively engage in constructing musical meaning employing their own experience and knowledge of the world.

Chapter 3 focuses on musical performances and a human performer's gestures, which provides one's experiential framework of music cognition. In this chapter, it is argued that the expressiveness of music is related to the nature of human beings. With an overview of general gesture classification, the focus moves toward the expressive, metaphoric gestures created by a human performer during a musical performance, which will be called *performative gestures*. Performative gestures, as the bridge between musical ideas and actual sounds, represent the performer's corporeal interpretations of musical ideas and support the performer's internal cognition of musical ideas by utilizing the multidimensional sensations of sounds. Therefore, it is argued that the listener can easily conjure up an image of a human performative agent by perceiving the expressive quality of gestures in acousmatic sounds.

Chapter 4 illustrates how one's embodied reasoning of acousmatic sounds and their features in terms of a human's bodily movements create the sense of performative agency in acousmatic music. The musical example, *PianoForte* by Yu-Chung Tseng, is analyzed, focusing on the characteristic gestures and their variations as well as the resultant perception of performative agency.

Chapter 5 concludes the dissertation by providing a summary and further discussion.

Delimitation

The subject of this study is the performative agency perceived in acousmatic music, mediated by loudspeakers in the absence of visual sources. Other forms of electroacoustic music that involve any type of performer or live element, such as live electronic music using instruments, sensors, network or live coding, are excluded from the discussion. Soundscape works, although composed for fixed media, are excluded as well, because a sense of performative agency is rarely involved. Also, acousmatic music diffused in real time by the composer remains outside the scope of the discussion, since it contains a live element that can create different perceptions from that of the fixed sounds.

CHAPTER 2
EMBODIED APPROACH

Introduction

Movement and sound are intertwined. Sound, despite its phenomenological and ephemeral nature, is also kinetic and physical. Caused by physical movement through vibrations of an object, sound's physical energy generates air pressure fluctuations to which our barometric ears respond. Music, which employs sound as a medium, is inseparable from the kinetic nature of sounds since it consists of successions of sounds in movement; hence musical movement.

The word *embodied* means "body and mind have been brought together" (Varela, 1993, p. 27). Influenced by James Gibson's ecological theory, the embodied approach to music cognition asserts that cognition of a meaning arises from the inseparable relationship between the body, mind, and musical sound. In this mind-body unity, perception is directly and immediately connected to actions as well as the imaginations and simulations of actions. The fundamental aspect of musical experience is that perception and action occur nearly at the same time. One acts to create a musical sound and immediately perceives the resulting sound through the body's sensory organs. One's perception of the sound, with which one is bodily engaged, is multimodal (e.g., auditory, visual, kinetic, etc.). Embodied perception of music results in an action-oriented perspective of musical sounds, meaning music is understood in terms of bodily movement; hence *corporeal interpretation*. According to Marc Leman (2008), this corporeal interpretation of music is referred to as *embodied resynthesis* in the sense that "important aspects of the outer world, particularly music, would in fact be captured in terms of actions" (p. 88). From the same viewpoint, Arnie Cox (2006) claims that

embodied experience is the key to experiencing music and interpreting musical meaning, as demonstrated by the following statement:

> musical meaning is generated by our embodied experience of it - that our embodied experience is not only necessary for experiencing meaning that is somehow inherent in the music itself, but that meaning arises in our conceptualizations of embodied musical experience and that abstract meaning is the *product* of embodied reasoning. (Cox, 2006, p. 45-46)

This chapter reviews the general concepts of embodied perception and music cognition as well as how the embodied paradigm influences perception of acousmatic music and challenges Schaeffer's idea of reduced listening.

Embodied Paradigm

In contrast with traditional theories that regard perception as a mental operation of sensory input, the embodied perspective suggests that humans perceive the world through the constant interaction between the body, mind, and environment. Taking "the body with its perceptual and motor capacities as the point of departure" (Jensenius, 2007, p.11), an embodied approach to cognition incorporates bodily sensation and experience as the basis for grasping meaning.

Not only is Schaeffer's microscopic investigation of sound influenced by Husserl's phenomenological view of perception, but the body, the major focus of the embodied paradigm, is also recognized in Husserl's view as perceiver. Husserl's idea of "natural standpoint" denotes that "we faithfully assume ourselves to be subjects situated within the external world" (as cited in Kane, 2007, p. 17). This concept, in which the subject perceives the world within which they also exist, points toward the recognition that the human body is engaged in the perceptual process. The body's movement is the critical method for adjusting one's viewpoint of an object, therefore obtaining various perceptions of the object. In the theory of embodied perception, which recognizes the

body as an engaged component of the perceptual process, it is argued that meaning is achieved through one's bodily experience of the world. Figure 2-1 illustrates how the notion of human body is developed from Husserl's phenomenology to embodied music cognition: Husserl's natural standpoint recognizes the body as an engaged component of the perceptual process. Gibson's ecological theory highlights the link between the body's action and resultant perception. Embodied music cognition defines one's bodily, multimodal experience as the fundamental framework of music perception. And, the framework is extended to include one's experience of living and the world for acousmatic music perception.

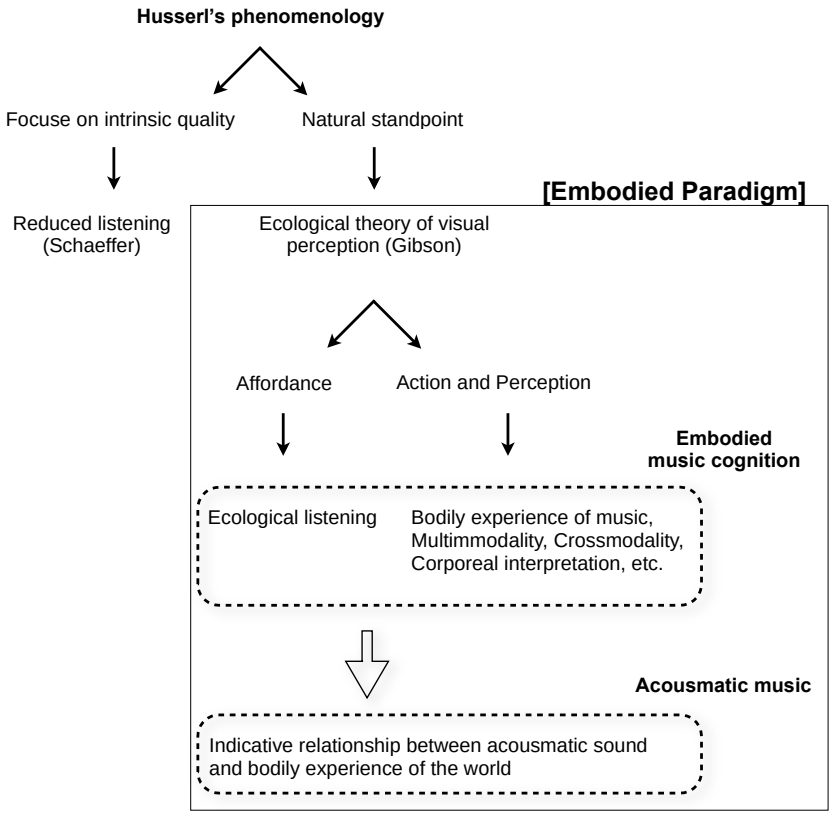


Figure 2-1. The flow of notions on the human body and the environment

Ecological Theory of Perception

Taking the body and its movement as the crucial factor of human perception, the embodied perspective shifts the cognitive focus from an abstract mental representation to the body's direct experience and knowledge. At the core of the embodied approach to perception is James Gibson's work, which focuses on direct perception from the human's sensory organ instead of mental processing. Gibson's ecological theory of visual perception places an emphasis on the interactive relationship between perception and action.

Direct perception

Gibson coined the term *ecological psychology,* based on the view that humans, as organisms in the ecological system, directly perceive meaning through interaction with their environment. He proposed that perception is the method by which all living organisms explore their surroundings and adopt the proper behaviors for survival. Gibson (1966) argues that the perception of the world, situated in the interactive relationship between humans and the environment, is not a cognitive mental interpretation but "a direct response to things based on stimulus information" (p. 91).

Gibson's theory is an extension of Husserl's natural standpoint in the sense that the subject and object are situated together in the world and the subject explores the object from various viewpoints. The difference between Gibson's and Husserl's stances is where the essential meaning of an object is found. Husserl says that the essence, the eidetic image, of an object is constituted from various perceptions of the object's intrinsic qualities. For Gibson, the essence of an object is directly picked up from a consistent, invariant feature, which reinforces itself through a flux of information. Eric

Clarke (2005) syas, “these invariant properties are those of the stimulus information itself - not a representational projection by the perceiver” (Clarke, 2005, p. 34).

Action and perception

In his book *An Ecological Approach to Visual Perception*, Gibson (1979) states, “one sees the environment not with the eyes but with the eyes-in-the-head-on-the-body-resting-on-the-ground” (p. 205). Traditional theories of visual perception are based on empirical studies conducted in laboratories, focusing on how a subject can differentiate, classify, and organize the properties of an object, such as shape, color, size, texture, material, etc. In Gibson’s ecological viewpoint, however, visual perception is the result of the interaction between the body’s movement and vision, not the result of seeing only a particular spot. Gibson states, “we need to see all the way around at a given point of observation and to take different points of observation” (1979, p. 1). While adjusting one’s body position to perceive an object from various angles, one also perceives one’s own movement and how it affects the changing perception of an object. Focusing on the movable body enabling the adjustment of one’s viewpoint, Gibson places an emphasis on the interdependence between perception and action: “we must perceive in order to move, but we must also move in order to perceive” (1979, p. 223). Therefore, “actions lead to, and enhance, direct perception, and are in turn the result of, and response to, perception” (Clarke, 2005, p. 19).

Affordances

Gibson (1979) suggests that in the ecological world the subject’s focus of perception is on the object’s function rather than on its abstract qualities. In other words, the subject is interested in the quality of an object that is important to him or her. Gibson developed the term *affordances* to denote this selectively perceived quality of an object:

“the affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill” (1979, p. 127). Based on the close relationship between perception and action, Clarke (2005) argues, “affordances are primarily understood as the action consequences of encountering perceptual information in the world” (p. 38). For instance, while listening through a window to people screaming loudly on the street (auditory stimuli), one would imagine some people fighting on the street (the initial perception). One may walk to the window and look outside (adjusting for a different perspective), finding out that a woman was screaming at the man who just snatched her purse (additional perception). Then, one may close the window to block the noise, decide to see how it resolves, or call the police (the resultant action).

According to Gibson (1979), affordances are not solely what the environment offers an observer, but interdependent on both the environment and the observer. This is because, as discussed earlier, one’s perception of an object also depends on the perception of one’s own body’s position in relation to the object. In the following quote, Gibson points out that *exteroception*, perception of the outside world, coexists with *proprioception*, perception of one’s own body position and movement:

> An affordance, as I said, points two ways, to the environment and to the observer. So does the information to specify an affordance. But this does not in the least imply separate realms of consciousness and matter, a psychophysical dualism. It says only that the information to specify the utilities of the environment is accompanied by information to specify the observer himself, his body, legs, hands, and mouth. This is only to reemphasize that exteroception is accompanied by proprioception - that to perceive the world is to coperceive oneself. This is wholly inconsistent with dualism in any form, either mind-matter dualism or mind-body dualism. The awareness of the world and of one’s complementary relations to the world are not separable (Gibson, 1979, p. 141).

Affordances are also subjected to an individual perceiver’s perceptual capacity and interest. Luke Windsor (2000) argues that the affordance is “a relationship between

particular environmental structure and a particular organism's needs and capacities" (p. 11). One can also choose to alter a basic affordance of an object to fit in a different context. Alexander Jensenius (2007) argues, "an object may have multiple affordances, and these affordances are dependent on the individual, the culture, and the context within which the object is located and used" (p. 16). For example, a pillow may be used for padding the seats in a truck, blocking noise, etc., in addition to its basic affordance, an object to rest one's head on. As one's experience and knowledge of the world progresses, one's perceptual capacity and creativity to imagine additional affordances can develop.

Ecological listening

Clarke (2005) proposes a way of listening called ecological listening, extending Gibson's theory of visual perception into the field of auditory perception. In ecological listening, listeners can not only understand the sounds in the musical context but also pick up what is directly specified by sounds. Clarke argues musical meaning can be found from the affordance of music, such as "dancing, worship, coordinated working, persuasion, emotional catharsis, marching, foot-tapping, and a myriad other activities of a perfectly tangible kind" (2005, p. 38). He also points out that music has the potential to have invariant features that, according to Gibson, define the essence of auditory stimuli, such as a theme or motif. Although a theme of a piece of music may appear varied under transpositions and/or transformations throughout the piece, the identity is retained and perceived by listeners. Wagner's recurring theme, the *leitmotif*, is a representative example; it is clearly identifiable regardless of how it is modified in terms of rhythm, harmony, or orchestration.

Clarke draws an example in which multiple affordances emerge in various perspectives outside of musical context: an F major chord played on the piano may be perceived as "'a cadence played on the piano' (a tonal context)" or "'an extract from an aural test' (a social function)" (2005, p. 45-46). As another example in which musical sounds can be understood in various aspects simultaneously, Clarke discusses Jimi Hendrix's performance of *The Star Spangled Banner* at the Woodstock festival in 1969. *The Star Spangled Banner* entails musical and extramusical affordances, including the National Anthem (Nationalism and convention) identified by its intervallic and rhythmic invariants, rock (musical genre) by its invariants such as electric guitar, distortion, etc., and Jimi Hendrix (African-American virtuoso) by his improvisational embellishment. Clarke argues that various aspects identified in the performance, such as culture, ideology, instrument, and the human body, are "a part of the total environment," that is, "specifications of the material relative to listeners enculturated in a particular context" (2005, p. 60-61). His approach suggests that, in the ecological view of listening, music is perceived not only in terms of musical materials (e.g., melody, harmony, etc.) but also in terms of extramusical context reflected in the musical materials. Though the labels of ecological listening and acoustic ecology are similar, there is not meant to be any connection between these theories.

Embodied Music Cognition

Embodied cognition claims that one's experience of body and mind interaction during musical activities constructs his or her perceptual framework of music cognition. A sound and the causal action behind the sound are perceived together, therefore leading to the recognition of causal agency of the sound.

Body and mind interaction in music cognition

The interdependent relationship between action and perception, as described by Gibson, is based on constant feedback from action to perception and vice versa (Hurley, 2001 & Leman, 2008). Action with a sounding object causes physical perceptions, such as audition, vision, etc. The body and mind work together closely, perceiving the sensation resulting from an action with an object. After the initial action and perception, one can modify the action, therefore reacting to the object and achieving an additional perception. The sequence repeats until one's perception of the object is established. Through this constant feedback between action and perception, cognition emerges and evolves. The sequence of action and perception is deliberately carried out in performing or other sound-making activities.

The *action-reaction cycle*, suggested by Leman (2008) as a model for musical instrument making, is a good example of the iterative process between action and auditory perception (Figure 2-2). In this cycle, one acts to create a musical sound (Play) and perceives the resultant resonance of an instrument (Listen). The sound quality is evaluated within the constraints of natural and cultural environments (Judge), and the property of the instrument is modified for optimizing future judgment (Change). The re-played sound after adjustment is compared with the previous sound, to evaluate the improvement made by earlier adjustments. The re-played sound may satisfy the natural and cultural requirements for the instrument. Otherwise, additional changes may be applied to the instrument. This action-reaction cycle is a process in which the initial sound is refined by constant adjustment until it becomes the final, desired sound.

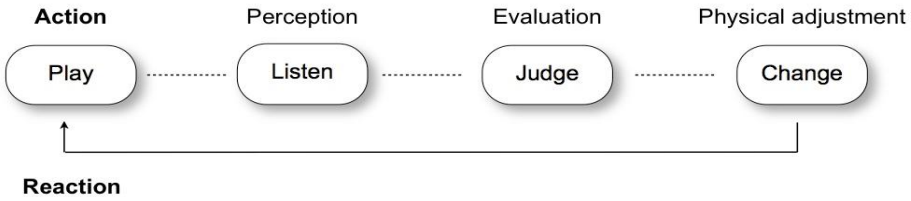


Figure 2-2. Illustration of Leman's action-reaction cycle for instrument making

This process involves one's ability to re-create the sound from one's memory, which was either previously perceived in the cycle or is aesthetically desired. The ability to imagine a sound in the absence of its source is called *musical imagery* (Repp, 2001 & Baker, 2001). The research on musical imagery is based on the notion that musical sounds can be recalled and re-experienced in one's mind without the presence of a sound source (Godøy, 2001). For example, musical imagery can be used for sight-reading or rehearsing without making actual sounds, for recalling a tune from memory, and for imagining the sound for a new composition. Godøy further argues that an image of a new musical sound can be invented through one's "inner ear" (2001, p. ix), by altering and developing the properties of previously perceived sounds. While composing a piece, a composer may imagine how the development of a musical idea will sound or how the timbre created from an unusual combination of instruments will sound.

Musical imagery plays a crucial role in musical practice as a performer evaluates the immediate sound from an instrument (Repp, 2001). Varela, Thompson & Rosch (1993) discuss the way that performers also constantly undergo this progressive interaction between perception and action until the musical imagery of ideal sound is realized as the actual sound, overcoming technical challenges:

> As one practices, the connection between intention and action becomes closer, until eventually the feeling of difference between them is almost entirely gone. One achieves a certain condition that phenomenologically

> feels neither purely mental nor purely physical; it is rather a specific kind of mind-body unity (Varela, Thompson & Rosch, 1993, p. 29).

In this state of mind-body unity, embodiment, a musical intention is realized successfully through the use of the right technique, which involves physical control and comparative perceptions. The constant feedback between modified action and its resulting perception, as well as the comparison between the current sound and musical imagery are the key to refining and reinforcing the quality of musical sound. Figure 2-3 illustrates an action-reaction cycle involving musical imagery in musical practice: hence an action-imagination-reaction cycle. In the action-reaction cycle, Change refers to the change applied to a musical instrument. However, in this action-imagination-reaction cycle, Change refers to the adjustment in the performer's mind that will be applied to the next Play. Therefore, the difference between these two models is whether a change is made to the instrument or the performer's bodily movement. A performer recalls the imagery of a desired sound and compares it with the actual sound that is played. Then, the performer adjusts his or her bodily movement for the next Play. It should be noted, however, that comparing the actual sounds with musical imagery is not successful all the time. Performers sometimes fail to hear the sound they are really playing while focusing on the sound they are imagining. For this reason, Boris Berman (2000) argues that a professional pianist should be able to balance between their "subjective ear" for hearing the imaginary sound and "objective ear" for monitoring the sound that actually comes from under their fingers (p. 4). A performer's ability to utilize both subjective and objective ears will ideally lead to proper judgment about their performance, therefore resulting in the achievement of the desired sound.

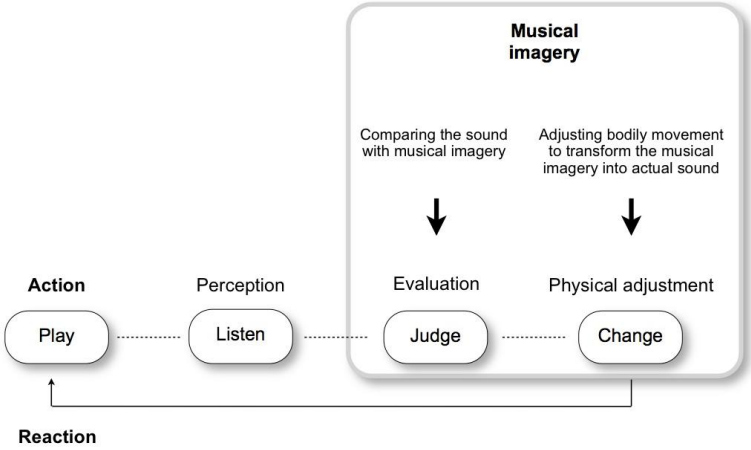


Figure 2-3. An illustration of action-imagination-reaction cycle for musical practice. Musical imagery is involved in the Judge and Change steps. In the context of musical practice, Change refers to adjustment that will be applied to the body's movement at the next Play (reaction).

Multimodal network

This embodied musical experience, or sound-making experience, demonstrates the close link between a sound and its causal action as well as various bodily sensations (e.g., vision, touch, sense of force and direction, etc.) related to that action. Jensenius (2007) puts forth the concept of the *action-sound chain* from cognitive process to sound in which multimodal sensations in all parts of the chain are directed to one's brain (Figure 2-4). The motor component used in playing an instrument, for example, can entail the performer's limb movement with tensed muscles applying energy to an instrument as well as the adjustments of his or her hands, fingers, and wrists. The perception arises from this experience through the body and its sensory organs: the tensed muscles before playing an attack sound and their relaxation afterward, the limb movement toward an instrument, the tactile sensation of fingers through which the vibration of the instrument is felt, the vision of all these phenomena, and the auditory experience of the instrument's resulting sound.

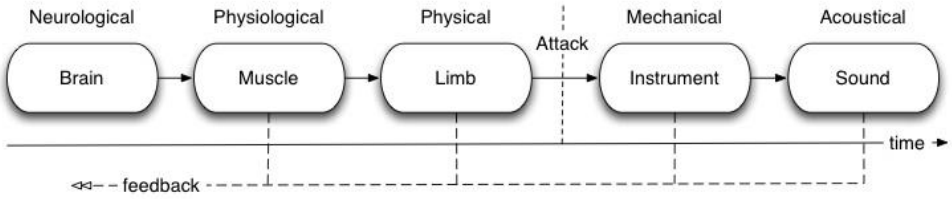


Figure 2-4. The action-sound chain, adapted from Jensenius, A. 2007. Action-sound: Developing methods and tools to study music-related body movement (page 24, Figure 3.2). University of Oslo.

Multiple sensations involved in musical activity occur simultaneously and are linked closely with each other in one's experience of musical activity. The human's sensory perceptions include sight, hearing, touch, smell, taste, and balance (Jensenius, 2007, p. 13). Among these sensory perceptions, modalities required the most for musical activity are *visual*, *auditory*, *tactile*, *kinesthetic*, and *proprioceptive* modalities, as shown in Table 2-1.

Table 2-1. The human senses involved in musical activity

Modality	Sensory perception	Examples
Visual	Sight	Vision of an instrument (e.g., keys, mallets, bows, etc.)
Auditory	Hearing	Sound of an instrument (e.g., tone, noise, etc.)
Tactile	Touch	Vibrations of strings, texture of keys, etc.
Kinesthetic	Force and movement	Muscular tension from making vibrato, beating, finger movement for playing arpeggios, etc.
Proprioceptive	Body position and balance in relation to other objects	The body's movement toward or away from an instrument, the arms' movement for big leaps, etc.

Visual and auditory perceptions can be achieved by seeing an instrument and listening to the sound of the instrument. Tactile perception is gained from the direct contact between one's body and the instrument, such as the sensation of the fingers on the string, key, valve, etc., or the air pressure on the lip. The tactile sensation can also be achieved from the indirect contact between one's body and the implement, such as

mallets, bow, etc. Proprioception is often confused with kinesthesia, “the sensation of joint movement, either from internal forces (active) or external forces (passive)”. However, proprioception, referring to “conscious sensations of muscle sense, kinesthesia and postural equilibrium”, also includes the sense of one’s own body relative to the space where he or she is (Lephart & Fu, 2000, p. xxii). The following definition of “Proprioception” (International Association for Dance Medicine & Science [IADMS] 2008) provides a good description of proprioception:

> Proprioception metaphorically is called the “sixth sense,” extending the classical five senses to include the body. This body sense is more than just a feeling of movement, however. It is intimately tied to our feeling of muscle tone, perceptions of effort and of balance. Specialized nerve endings originate in our muscles, fascia, tendons, ligaments, joints, and some scientists even include the skin. There “afferent” (sensory) receptors perceive deformation of tissue - the amount of pressure (stretch or simply, placement), speed at which movement is occurring and the rate at which the speed is changing (velocity), direction of movement, and - when deformation is extreme - pain (IADMS, 2008, p. 1).

In musical performance, kinesthesia is involved in controlling fingers’ muscles for playing repeated loud notes, or the arm’s muscle applying bow pressure on the strings. Proprioception is used for adjusting one’s body and arms’ movement for playing an arpeggio phrase over the whole register or playing big leaps across a wide range.

The listener’s understanding of musical sound also incorporates their experience of the multimodal perceptions related to the musical sound. Various sensations that are derived from the same event are inextricably connected with one another. Due to this multimodal nature of musical perception and experience, perceiving an event in one modality can activate other sensations in different modalities related to said event, therefore causing cross-modal perception. The cross-modal perception between audition and vision is illustrated in the fact that one can imagine the vivid sound that is

absent in a silent film or envision the images related to a narrative aired in a radio broadcast.

In terms of music cognition, James Baker (2001) argues that even a rough simulation of the causal action can help imagine a sound, giving the example in which music students frequently gauge intervallic distance on imaginary instruments, often a keyboard and string instruments, while solving dictation problems. Godøy (1997) places an emphasis on the visual correlates between the sensations of movement and sound in his *triangular model* of cross-modality between image, action, and sound. Godøy's idea is based on the notion of *action trajectory*, which is a temporal-spatial domain providing both procedural proprioceptive and visual components (1997). Therefore, a musical sound can easily be recalled by simulating the action component. For example, a musically trained listener can easily visualize a performance, including the performer's gestures that create the sound by listening only to the sound. While listening to a recording of Scherzo No. 1 by Chopin, a listener can imagine the pianist's hands bouncing off the keyboard immediately after playing the note on the first beat of measure 16 (Figure 2-5). As seen in the score (Figure 2-5), musical tension is built through increasing pitch and volume played by the right hand toward the note in measure 16, which is the loudest and highest one of the segment (mn. 9-16). The gesture, moving the hands upward at the end of the segment, is related to the momentum the pianist gained over the course of the segment. While this arm gesture moving upward occurs almost simultaneously with the note in measure 16, a listener can also visualize the pianist's arm gesture moving down on the lower register of the piano in order to prepare the following phrase in the next measure.

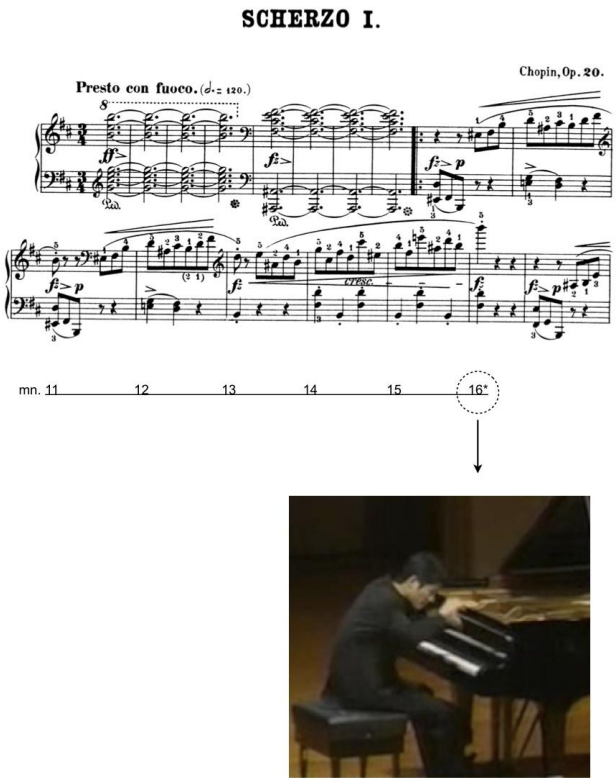


Figure 2-5. An example of the connection between movement and sound

A listener with performing experience may recall his or her memory of seeing the gesture in a performance of this piece, or imagine this gesture to be made in accordance with the musical flow. Depending upon a listener's knowledge of the composition and the performer who recorded it, he or she may also be able to imagine specific gestures similar to those from the actual performance. During a performance, it is also possible for a listener to predict the sound quality that is about to be produced by looking at the performer's preparatory movement. For example, a listener can hear the dampened sound of the vibraphone by looking at a performer who places a mallet on a bar and hits the bar with another mallet. A listener normally perceives the sound and vision of a musical performance better than other modalities. However, a highly trained

listener can also imagine the tactile and proprioceptive sensations that the performer would be experiencing during the performance.

Embodied reasoning based on experience and conceptual metaphor

One's embodied experience from musical performance and listening is engaged in understanding and conceptualizing the meaning of music. Listening to musical sounds, one can experience the bodily sensations related to the sounds by imagining or imitating the physical gestures that could create the sounds. Singing along with the song or playing an air guitar or air drum, the listener can feel like they actually play the sounds to which they are listening. This shows that listeners experience and understand music through their embodied participation, which involves "covertly and overtly imitating the sounds heard and imitating the physical actions that produce these sounds" (Cox, 2006, p. 46). Cox proposes that there are three ways of sound imitation involving motor actions: "[an] imitation of the arm and finger movements," "[a] subvocal imitation of the sounds produced," and "an amodal, visceral imitation of the exertion dynamic evident in the sound (a pattern of exertions that would produce the same or similar sounds)" (2006, p. 50). For example, one can imagine the finger movement over an electric guitar string and sing along with the melody in one's head. One can also imagine and feel the exertion required for a fast chromatic ascending scale. David Burrows (2007) states, "[t]hrough participation in music, the listener practices being in charge of sound" and "sound is experienced by perceptually vibrating in sympathy with it, participating in its movement" (p. 71). Cox (2006) also claims, "our comprehension of a sound involves comprehension of the relevant motor actions" (p. 48). In other words, one of the ways of understanding musical sounds is *performing* (action) or *recalling and imagining one's performing experience* (imagery of action) of the music, which brings

one's memory of multimodal bodily sensations related to the sounds and their causal actions.

In line with this view of music perception by one's action or imagined action, Johnson and Larson (2009) claim, "our very experience of musical meaning is fundamentally shaped by conceptual metaphors that are grounded in our bodily experience" (p. 78). Abstract sounds of music can be understood via metaphor conceptualized by one's imaginative interpretation based on one's bodily experience of sounds and actions. For example, a figure of ascending pitch is conceived as going up higher. The pitch difference between two notes is conceived as a distance between two locations; small and discrete differences conceived as 'steps'; greater and discrete differences conceived as 'leaps'. Johnson and Larson demonstrate that the perception of musical motion also involves conceptual metaphor, as seen in a listener's descriptions, such as *the music moves*, *something moves in the music*, etc. Johnson and Larson (2009) suggest the conceptual metaphor for *moving music*: a physical motion (musical motion) of an object (musical event) is created by physical forces (musical forces) in relation to an observer (listener) in the path of motion (musical passage). This is because combinations of various musical features (e.g., pitch, dynamic, articulation, etc.) create a perception that is similar to one's experience of seeing physical objects in the world that move or are moved by external force. A listener may use his or her experience with objects in a physical space for understanding the sense of moving objects in musical space. The metaphor of physical space and visual motion reflects the fact that one's multimodal experience based on "the structure of

sensory and motor operations" is deeply engaged in understanding music (Johnson, 2007, p. 180).

According to this conceptual metaphor by Johnson and Larson, sound-creating gestures can be understood as physical forces that cause an object to move at a particular speed over a particular path. Cox (2006) points out that the listener recognizes the intentional, expressive quality of those gestures, while experiencing the exertion of sound-creating gestures:

> According to the mimetic hypothesis, we experience patterns of exertion . . . as if we are acting . . . in a way that is more or less isomorphic with the sound-producing actions heard (and seen). In conceptualizing these patterns of exertion, we map these onto our own experience of making similar exertions, and among the most straightforward mapping is that onto gestures: we do not feel only abstract sensations of exertion; we also understand these as the intentional, expressive gestures that we have made and have seen made in other domains of experience. (p. 53)

This suggests that one perceives sound-creating gestures as intentional and expressive actions created by one's self. One's mimetic participation is similar to acting out "the role of a character or persona - that of an ideal gesturing performer" (Cox, 2006, p. 53).

Embodied Approach to Acousmatic Music

The listener's position for acousmatic music is different from that for traditional music for instruments or voice. In a traditional setting of musical performance, listeners perceive music while seeing a performer whose gestures cause the musical sound by the direct interaction with the sounding source. In this traditional setting of musical performance, listeners' perceptions of sounds and their origins are clear. In acousmatic music, the perceptual link between the sound and its origin becomes uncertain. The coexistence of sounds from diverse contexts (i.e., nature, culture, music, human, industry, electronic, etc.) obscures the boundary between real and imaginary. The

listeners of acousmatic music attempt to identify the connection between sounds and their origins. The listener may recognize a particular instrument from a sound, however, its timbral and gestural attributes may not be faithful to the instrument. For example, the listener recognizes a guitar sound that soon changes to something else: the resonance of plucked guitar strings continues to vibrate for an extended time, its varying loudness gradually creates a rhythmic pattern, and its timbre also starts morphing into a string instrument-like sound. In this case, the listener's knowledge about the guitar in reality does not help him or her understand what could cause these changes in the sound. This uncertainty of sound sources in acousmatic music increases when it comes to sounds that are electronically generated or heavily processed. With these highly abstract sounds, the listener may be confused by an unsufficient basis for understanding and interpreting these sounds.

Listening to acousmatic music mediated by loudspeakers, the listener is in a position of seeking the possible origins of ambiguous sounds and interpreting the musical meaning through his or her own perceptual capacity and experience. The listener may easily focus on familiar sounds that can be related to objects and events in the real world. For ambiguous sounds, the listener may attempt to relate them to his or her experience in the real world in order to find any slight connection to possible sources. When a sound has no connection to the real world, the listener may focus only on its pure timbral attributes in a musical context. This way of understanding musical sounds is similar to that of understanding a phrase of foreign language: grasping a few familiar words, inferring the meaning of other uncertain words, and then attempting to make sense of the whole phrase. The listener is encouraged to be flexible in employing

different focuses depending on the type of sound material and the context within which the sound is used. The listener may freely shift his or her focus from the physical attributes indicated by sound to the abstract acoustic quality of sounds as the sounds in acousmatic music are often transformed in unpredictable ways.

From the viewpoint of the embodied approach, acousmatic music can be perceived with regards to human and physical references, and therefore, Schaeffer's idea of the sonorous object and reduced listening is challenged. Godøy (2006) argues that gestural quality is inevitably perceived in even brief, abstract sound objects, under the principle of reduced listening. Godøy points out that Schaeffer also employed gestural concepts and metaphors for inspecting, evaluating, and classifying sound objects. In the typology of sound objects, for instance, Schaeffer identifies three types of envelopes of duration (e.g., impulsive, sustained, and iterative types) and links these duration envelopes to executive gestures (e.g., punctual, continuous, and iterative gestures). Arguing that the gesture associated with a sound object should be considered in the inspection of a sound object, Godøy coins the term *gestural-sonorous object*:

> The sonorous object can be inspected, explored, and progressively differentiated with regards to features, features which often evolve or have various envelopes which can be traced, hence in my opinion actually becoming more like what I would call a *gestural object.* (Godøy, 2006, p. 149)

In reduced listening, one focuses on a sound object's acoustic parameters and their evolution, such as dynamic envelopes, frequency contours, textural changes, etc. Godøy argues the listeners continuously trace these parameters of a sound by using their own body parts, such as "hands, fingers, arms, or other effectors," therefore conjuring up a gestural image related to the sound (2006, p. 149):

> This means that from continuous listening and continuous sound-tracing, we actually recode musical sound into multimodal gestural-sonorous images based on biomechanical constraints (what we imagine our bodies can do), hence into images that also have visual (kinematic) and motor (effort, proprioceptive, etc.) components. (2006, p. 149)

His argument suggests that, even under reduced listening that denies any physical reference to a sound, it is possible to perceive a sound as the result of a human's action and intention, based on the gestural quality of its acoustic features and their development.

Ecological Listening Strategy for Acousmatic Music

Windsor (2000) proposes an ecological approach to the interpretation of acousmatic sounds. The basic claim is that, in acousmatic music, sounds provide "unmediated contact between listeners and significant environmental occurrences" (p. 10). In an ecological framework, sounds are perceived as indicating a state or change of the environment. For example, a clock sound with a gradually increasing echo may inform a listener of a change of acoustic space from a bathroom to a cathedral.

Windsor (2000) refers to studies (Spelke, 1976; 1979; Warren, Kim and Husney, 1987) that demonstrate the relationship between a sound and movement. For instance, the sound of an object can specify the movement patterns of the object (a bouncing pattern of a basketball), the energy-motion transferred to the object (dribbled or thrown), and the internal structure of the object (basketball or golf ball). Depending on the listener's perceptual capacity established through his or her previous experiences, the listener could pick up the invariant features of a sound event and relate those features to a particular physical event. As the listener experiences various relationships between sound and movement, the listener's perceptual system will develop to easily recognize the invariant features of a sound. Windsor argues that "where these invariant structures

occur in acousmatic music a listener will be able to perceive the events and objects which would normally and lawfully give rise to such structure" (2000, p. 18).

Clarke's (2005) examples of ecological listening, illustrated earlier in this chapter, also showed how the various aspects of the environment are perceived in music. What makes this ecological listening different when it comes to acousmatic music is that acousmatic music can create an environment different from the environment in the real world. Windsor (2000) points out that the perception of acousmatic music can be drastically different from the perception of real events. The sonic environment of objects and events created in acousmatic music is perceived as being disconnected, extended, or transformed from the physical environment of objects and events in reality. In acousmatic music, an object does not offer an affordance consistent with what the object offers in the real world. Windsor states, "the acousmatic piece presents structure of an everyday kind, but such structure is contradicted" (2000, p. 22). This hybrid environment created in acousmatic music, therefore, allows the listener to create his or her own interpretation. Windsor argues that the listener is challenged to identify what the sounds afford and signify. In the following statement, Windsor emphasizes that the aesthetic of acousmatic music lies in the interaction between the sounds of a virtual world and the interpretive, imaginative listener:

> The listener perceives that some of the sounds specify events or the manipulation or juxtaposition of sounds that should specify events but fail to do so. The aesthetic nature of the acousmatic piece lies in its position between the demands of everyday perception and its contradiction of the specificity which provides for a structured and relatively unambiguous relationship with the world. (2000, p. 23)

Indicative Relationship and Gestural Surrogacy

Denis Smalley (1996) proposes the idea of the *indicative relationship,* an information-based listening that focuses on the physical occurrence, action, or object linked with a sound. The indicative relationship is originally taken from one of the Schaefferian listening modes, which Schaeffer himself considered insufficient for the sound of artistic music. Smalley argues, however, that the meaning of an acousmatic composition can be understood in the wider scope of "musical experience and our experiences of living" by integrating both the acoustic feature of a sound and the information the sound signifies (1996, p. 83):

> The apprehension of musical content and structure is linked to the world of experience outside the composition, not only to the wider context of auditory experience but also to non-sounding experience. Approached from the multiple perspectives of life outside music, the materials and structure of a musical composition become the meeting-place of sounding and non-sounding experience. Electroacoustic music, through its extensive sounding repertory drawn from the entire sound-field, reveals the richness and depth of indicative relationships more clearly and comprehensively than is possible with other musics. (Smalley, 1996, p. 83)

Smalley's (1996) approach to acousmatic music through the multiple perspectives of life contributes to the embodied comprehension of music based on the listener's bodily multimodal sensations. Smalley's concept of the *indicative field* that identifies "the link between human experiences and the listener's apprehension of sounding materials in musical contexts" includes nine fields: gesture, utterance, behavior, energy, motion, object, substance, environment, vision, and space (1996, p. 83). The experience in these fields is manifested in sound materials in musical contexts and perceived by the listener along with the sound's acoustic features. In this sense, a sound can be viewed as having two parts: the acoustic quality of a sound and the non-sounding experience attached to the sound. This is similar to semiotics, the study of

signs and symbols, which allows the separation of a sign into a *signifier*, “the object itself,” and a *signified*, “a possible meaning derived from that object” (Field, 2000, p. 41). In a musical context, a sound itself is a signifier and the non-sounding experience or meaning indicated by the sound is a signified. For example, when listening to a siren sound in acousmatic music, semiotic reasoning allows the listener to be able to recognize the sound’s timbral characteristics as well as the meaning signified by a siren in reality (e.g., emergency, nervousness, etc.). Therefore, the listener constitutes a meaning of the music incorporating both its musical and cultural contexts. This division of a sound into acoustic and non-acoustic features was also the basis of reduced listening. The contrast rests on the fact that semiotics and Smalley’s indicative field allow the coexistence of a *signifier* (i.e., a sound) and a *signified* (experience or meaning attached to the sound) within a sound while a *signified* is disregarded in reduced listening.

Acousmatic music can also involve exceedingly processed, abstract sounds that hardly indicate any human experience in the world. Smalley proposes that the acoustic features of an extremely abstract sound can be analyzed and slight evidence of the *indicative field* can be found. Smalley (1997) coins the term *spectromorphology,* which refers to “the interaction between sound spectra (*spectro*-) and the ways they change and are shaped through time (-*morphology*)” (p. 107), as a tool for describing and analyzing the listening experience. Similar to Godøy’s (2006) concept of the gestural-sonorous object, Smalley argues that the causal gesture behind a sound can be identified by the sound’s spectromorphology. Smalley views spectromorphology as the result of the interaction between source (sounding object) and cause (physical action):

> Sound-making gesture is concerned with human, physical activity which has spectromorphological consequence: a chain of activity links a cause to a source. A human *agent* produces spectromorphologies via the motion of gesture, using the sense of touch or an implement to apply *energy* to a *sounding body*. A gesture is therefore an *energy-motion trajectory* which excites the sounding body, creating spectromorphological life (Smalley, 1997, p. 111).

The recognition of an extramusical field signified by a sound provides the listener with a basis from which the origin of sounds that are surrogated from a reality can be inferred. Smalley (1996) introduces the notion of *gestural surrogacy* "to demonstrate the existence of new types of sounds which are more remote from physical, gestural origins" (p. 85). Smalley suggests "human experience of physical gesture" (1996, p. 85) as the basic gesture model, and categorizes the gestures of acousmatic sounds into three groups (i.e., first order surrogacy, second order surrogacy, and remote surrogacy), depending on the degrees of remoteness from the basic model. Smalley (1997) suggests that a listener may "refer to tensile, proprioceptive properties, to those characteristics of effort and resistance perceived in the trajectory of gesture," to infer the supposed sources and causes of sounds that are surrogated remotely from their physical origin (p. 112).

Ten Hoopen (1994) suggests the specific-surrogate continuum that illustrates the degree of surrogacy. A sound highly surrogated, hence alienated, from the original model of gesture is perceived almost as the result of a non-sounding object and non-physical gestures, therefore leading the listener to focus on the abstract timbral features of the sound. Ten Hoopen's (1994) viewpoint of the relationship between the specific-surrogate continuum and the sounding/non-sounding analogy illustrates that the listener tends to perceive extremely surrogated sounds as metaphors of non-sounding experiences:

> If we are able to identify an apparent source ("...this is the sound of...") then we are inclined to apprehend the resulting music in terms of sounding analogies which include qualities of actual sounds, objects or sounding phenomena existing in the real world. Moving away from the origin we enter an area in which we may infer sound sources ("...this sounds like...") with possible ambiguity. We apprehend sound material on the basis of *some degree of resemblance* of attributes of existing sounding phenomena. So, too, the sounding analogies become more ambiguous while still suggesting real world or human presence. Beyond this area of ambiguous recognition, we are inclined to comprehend sound material with reference to non-sounding analogies ("...it feels like...") because no links to sources can be experienced. (Ten Hoopen, 1994, p. 70)

The origin and cause of sound in acousmatic music can be ambiguous, depending on the degree to which a sound is disguised. The ambiguity of sounds allows a wide range of interpretations and may cause a disparity between the composer's intention and the listener's interpretation. The meaning of acousmatic music rests on the listener's interpretation to a greater degree than on the composer's native intention. Musical meaning is constituted by an individual listener, and there can be different interpretations between various listeners as well.

CHAPTER 3
PERFORMATIVE GESTURE AS MANIFESTATION OF MUSICAL INTERPRETATION AND THE INTERNAL COGNITION METHOD

Introduction

The focus of this chapter is on musical performance and gesture by a human performer. It will be shown that the qualities of sounds that conjure up a sense of performative agency are similar to the human qualities one perceives from a performer creating expressive sounds in musical performance. The cognitive interaction between action and perception is highlighted in musical performance more than in any other music-related activities, including listening, conducting, dancing, etc. Therefore, a performer's gesture, which is the critical action to creating the ideal sound, represents his or her musical interpretation and influences the expressive quality of musical performance.

This chapter begins with the definition of gesture, focusing on the qualities and functions of various gestures involved in human expression. The discussion of expressive gesture leads to the notion of performative gesture which functions as a corporeal bridge between a musical idea and its sounds. Looking into the expressive and cognitive aspects of performative gesture, it is argued that the unsteady and imperfect qualities of human beings give rise to the sense of a performative agent. With the evidence of human nature, the sense of a performative agent is differentiated from that of a causal agent.

Definition of Gesture

Gesture is a universal and intuitive way to create human expression. The *Oxford English Dictionary* (2nd ed., 1989) defines the word *gesture* as "a movement of the body, or any part of it, that is expressive of thought or feeling." In general, gesture is used

synonymously with movement, motion, and action to indicate any change of physical state. The broad range of definitions of gesture includes not only refined movements, such as a dancer's movement portraying *fear,* but also one's involuntary body movements, such as cowering in *fear*. Although both are expressive of the feeling *fear*, the dancer's gesture is differentiated from the cowering gesture in the sense that it is consciously created with particular intentions and meanings in the context of performance. Furthermore, the term gesture is also used to indicate a symbolic attitude, such as a 'welcoming gesture' or a 'nice gesture'. This is because gesture can be perceived in a metaphorical sense.

Liwei Zhao (2001) points out that there are two types of approach to gesture research. One approach is concerned with a conceptual understanding of gesture and its function, and is employed in the research of linguistics, psychology, neurology, choreography, physical therapy, etc. The other approach focuses on gesture in a system-oriented context, including the fields of computer vision, human-computer interaction, human motor control, and computer graphics and animation. Focusing on the gesture's functions, David McNeill (2000) categorizes gesture into human communication, cognitive psychology, and modeling. Combining these classifications by Zhao and McNeill, Jensenius and others present three divisions of gesture: gesture for *control*, gesture as *communication* and gesture as *metaphor* (Jensenius, 2007; Jensenius, Wanderley, Godøy, & Leman, 2010).

Gesture for control is concerned with the gesture's measurable functions, and an example of this gesture is the gesture-oriented interaction between a human and computer devices and interfaces, for example, a touch pad. Gesture for control is mainly

used for operating a system, while the other gestures are involved in human expression and perception. Jensenius (2007) points out that human-computer communication, in contrast with human-human communication, is restricted by the computer's lack of sensing capability. What the computer understands from a gesture is the input information indicating a certain command regardless of the way the gesture is expressed. For example, the result of pressing a button stays identical whether it is pressed heavily with an arm or lightly with a fingertip. What is important in human-computer communication is that *the button* is pressed, not that the button is pressed *aggressively* or *gently*.

The idea of gesture as communication represents the creative and supportive role that gesture plays in human communication, for example, a hand gesture along with speech. The gesture created with speech or musical sound serves to accompany and/or reinforce the expression of an idea or meaning. When expressed with both gesture and speech, the idea is easier for listeners to understand, therefore improving communication between the speaker and listener.

Gesture as metaphor indicates the cognitive aspect of gesture in which one perceives a stimulus, especially an abstract idea, as an image. The image perceived from an abstract idea is converted to a few simple gestures in one's mind, therefore supporting one's understanding of the idea. Gesture as metaphor can also be involved in expressing an idea while one speaks or performs. An example can be found in the gestures that one makes seeking the proper word for expressing a meaning. Figure 3-1 illustrates Jensenius's (2007) division into three types of gesture. Gesture for control

that serves an operating function is distinguished from gesture as communication as well as gesture as metaphor that are involved in expression of meaning.

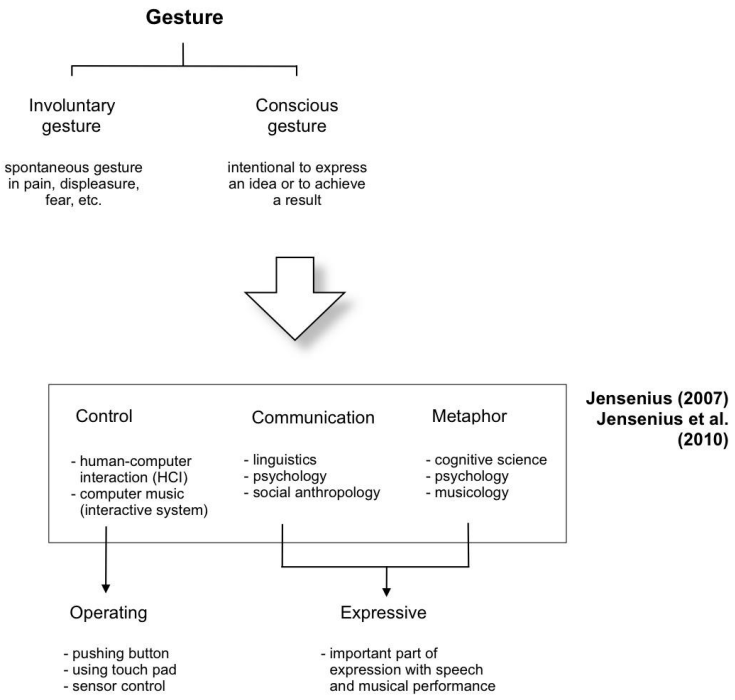


Figure 3-1. Three categories of gesture: gesture for control, gesture for communication, and gesture as metaphor. Note that gesture for control performs an operating function while gesture for communication and gesture as metaphor are involved in expression of meaning.

Co-expressive Gesture

Gestures are used not only for accompanying the expressed idea but also for perceiving, hence concretizing, the idea during speech and musical performance. Thus, it can be suggested that gesture as communication and gesture as metaphor can be considered as *a co-expressive* gesture. The following discussion focuses on the co-expressive role of gesture in speech and musical performance. McNeill and Duncan (2000) define the co-expressive relationship between gesture and speech:

> The gesture and its synchronized co-expressive speech express the same underlying idea unit but do not necessarily express identical aspects of it.

> By looking at the speech *and* the gesture jointly, we are able to infer characteristics of this underlying idea unit that may not be obvious from the speech alone. (McNeill and Duncan, 2000, p. 142-143)

McNeill (2000, 2005) points out that although gesture and speech are two different modes of expression (i.e., gesture imagery and linguistic code) they are combined as a single expressive system. In musical performance, the performer's gesture and musical sound are also engaged with the same musical idea (Wanderlay and Vines, 2006). Speech and musical performance both use gesture to accompany the musical or verbal expression of an idea. Many researchers have suggested that speech and musical performance have similar aspects. Sundberg states, "speech and music are the two main forms of systematized interhuman communication by means of sound signals" (Sundberg, 1988, p. 65). Wanderlay and Vines (2006) also acknowledge the similar functions of gesture in speech and musical performance, which is to accompany, reinforce, and modify an idea or emotion. The only difference between gestures in speech and musical performance is that gesture in musical performance is also used as a direct method for creating the musical sound. Especially for instrument playing, the musical sound results from the performer's gesture interacting with the instrument.

Gesture in Speech

Adam Kendon (2004) defines gestures as "actions engaging speakers' intention to express or inform something" (p. 8). He emphasizes that gestures should be carried out consciously and explicitly in order to be perceived by an observer (Kendon, 2004). Kendon's description shows how co-expressive gesture is created in an expressive, deliberate way in contrast to an involuntary and operating gesture:

> … movements made under the guidance of an openly acknowledged intention to convey meaning are directly perceived as such as a consequence of characteristics of the movement's dynamic features which

> ‘compel’ the observer to see them in this way. If an action is an excursion, if it has well defined boundaries of onset and offset, and if it has features which show that the movement is not made solely under the influence of gravity, then it is likely to be perceived as gestural. (Kendon, 2004, p. 14)

Several types of gesture are suggested by combining the approaches of McNeill (1995) and Cassell (1994 & 1998): *Iconics*, *Metaphorics*, *Beats*, *Deictics*, and *Emblems* (Zhao, 2001, p. 1). It can be argued that each type of gesture can communicate different degrees of indicative/expressive quality, as illustrated in Figure 3-2. Emblems refer to culturally established expressions, such as the “goodbye” or “OK” sign. Iconics represent a particular feature of an object by describing its shape, or illustrate the action by reproducing it in an empty space. A knocking movement with a hand while saying *knocking on the door* is an example of Iconics. Emblems and Iconics are clearly indicative and self-explanatory. Deitics indicate a specific direction, for example, pointing in a space while saying *over there*, hence turning the observer’s attention to where one points. Beats are hand movements occurring with specific words, highlighting their meaning. Beats reflect a speaker’s own interpretation as evidenced in storytelling. Depending on the narrator, different words are emphasized by pausing, cutting short, elongating, raising in pitch, etc. Metaphorics represent features of an object or an abstract concept, for example, holding up the hands to refer to *something* while saying *something happened*. These gestures are Metaphorics not because of structural features but because of the relationship with what they represent. The same gesture can be Iconic or Metaphoric depending on the context within which the gesture is used. For example, holding up one’s hands with the palms facing up can be an Iconic gesture while saying *empty hands*. However, it can also be a Metaphoric gesture while saying, *I have nothing to say*, referring to *nothing* in the sentence. The expression of

Metaphorics varies with the individual speaker. A speaker may also say *I have nothing to say* while waving their hands. In this case, waving their hands is a metaphoric gesture, indicating *nothing*, not *goodbye*.

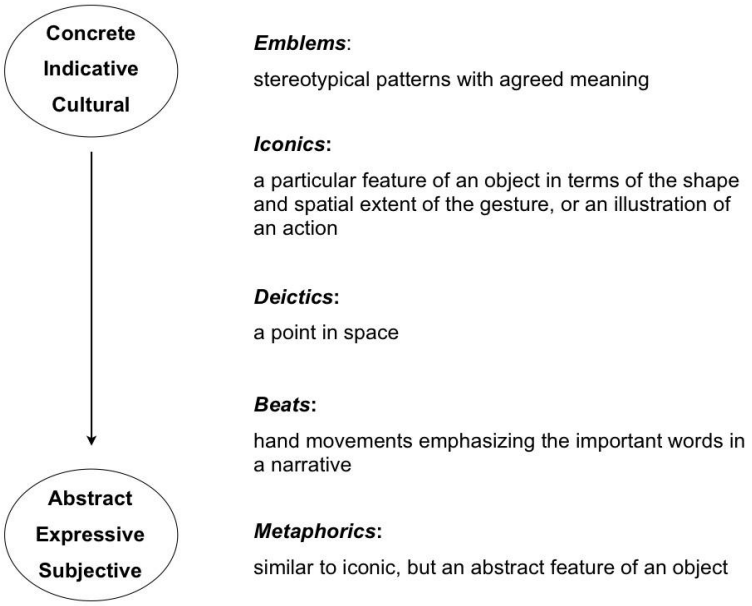


Figure 3-2. The types of gesture arranged based on the level of indicative or expressive aspect. Metaphorics are highly subjective and barely indicative whereas emblems are highly indicative and hardly subjective.

Given this perspective, it can be suggested that beats and metaphorics are closely related to each speaker's own subjective, expressive interpretation of an abstract idea. McNeill (1992) argues, "mental imagery is embodied in the gestures that co-occur with speech" (p. 37). Therefore, the image of an abstract idea in the speaker's mind provides visual attributes based on which gesture can be created. Metaphorics are approximate, rather than detailed, representations of abstract features. By offering visual and spatial properties derived from the image of abstract features, metaphoric gestures help listeners understand ideas better through simple bodily interpretations.

A benefit of using metaphoric gestures in speech is that one can present a meaning in terms of continuous movements in space and vision, contrary to the linguistic code that breaks up and represents a meaning in a linear structure (Goldin-Meadow, 2003). For instance, an upward hand gesture to indicate *high intelligence* represents the level of intelligence by the visual instantiation of a vertical axis in a space. Thus, the aforementioned *high intelligence* is perceived as having a measurable physical quality. Figure 3-3 illustrates that an abstract concept is expressed by linguistic code as well as gesture, which is created based on the image perceived from the concept.

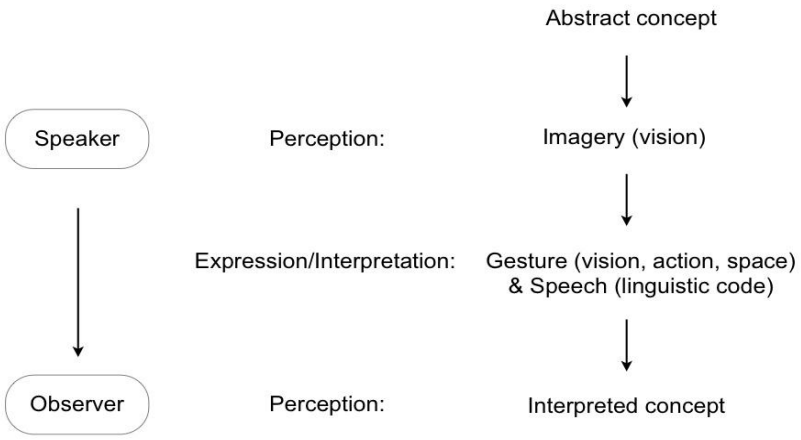


Figure 3-3. The communication of an abstract idea from the speaker to observer, in which the perception of an abstract concept as an image in the speaker's mind is expressed by gesture as well as speech.

Musical Gesture

Influenced by embodied perspective, the term musical gesture is used to denote the combination of both physical gesture and musical sound that represents the energetic shaping of motion through time (Jensenius, 2007). Godøy and Leman state, "musical experience is inseparable from the sensations of body movement" (Godøy & Leman, 2010, p. 3). As discussed in the previous chapter and in this chapter, one's

body plays a critical role in musical activity, whether performing or listening. Especially in musical performance using voice or instruments, the performer's bodily movement and the resulting sound are inextricable. Regarding the body and its movement as the essential technique of piano playing, György Sandor (1981) mentions, "sounds are the result of motions, and motions must correspond to emotion" (p. 4). In addition, Clark (2002) describes how the body is incorporated in singing: "First we move. Before we sing, we must be aware of our body. We take a deep breath, and the heart pumps faster, the blood flows to the extremities, the muscles flex and stretch, and we take a step forward" (p. 3). Many studies have shown that performers' movements are essential for creating a sense of motion and musical expression (Berman, 2000; Burrows, 2007; King, 2006; Pierce, 2007; Repp, 2001; Sandor, 1981; Shove & Repp, 1995; Wanderley & Vines, 2006). A performer's movements are deeply related to musical features and their progression such as dynamic contour, pitch contour, phrases, etc.

Due to the inextricable relationship between sound and its causal body movement, one perceives musical sounds as "organized through processual shapes which seem to be analogous to physical gesture" (Middleton, 1993, p. 177). From the same viewpoint, Godøy and Leman (2010) argue that music-related gesture embodies musical meaning, and suggest that "gesture can be defined as a pattern through which we structure our environment from the viewpoint of actions" (p. 8). This, in line with the concept of embodied cognition, focuses on the human's bodily experience of musical activities. Therefore, Godøy and Leman regard musical gesture as "an expression of a

profound engagement with music," and as "an expression of a fundamental connection that exists between music and movement" (2010, p. 3).

The research on musical gesture focuses on music-related movements (e.g., the performers' and listeners' movements) that reflect musical meaning and the way music is perceived. Jensenius (2007) divides music-related movement into four functional categories: *sound-producing, communicative, sound-facilitating, and sound-accompanying gestures*. Sound-producing gestures are those that produce sound directly with the body or indirectly with a mallet or bow. Sound-producing gestures are subdivided into gestures of excitation (e.g., hitting, stroking and blowing) and gestures of modification (e.g., varying degrees of bow pressure, vibrato, mute, etc.), which affect the quality of sounds. Sound-facilitating gestures are not directly involved in sound-production, but expressive of or synchronized with musical features (e.g., phrases) therefore they support producing and shaping the resultant sounds. Examples of sound-facilitating gestures are a singer's arm gestures or a vertical movement of the clarinet bell at the beginning and end of a phrase. Sound-facilitating gestures are metaphoric in the sense that the gestures are co-expressive of the musical features. For example, a flutist may bend their knees at the beginning of a phrase that starts low in pitch, and gradually straighten their knees as the phrase develops with a series of chromatic scales going up in pitch. In this case, the body position moving upward metaphorically represents the rising pitch and perhaps the increasing tension as well. Further, a cellist may hunch down over the cello while approaching a climax of a phrase, to represent musical intensity with such a strained body. Communicative gestures are used between performers (e.g., conducting and eye contact) or between performer and perceiver (e.g.,

facial expression with eye contact) during musical performance. Sound-accompanying gestures, resulting from the perception of musical sound, trace or follow the musical qualities, for example, mimicking the perceived sound with an air guitar while listening to rock music.

It is impractical to define a gesture as only falling into one specific category. Jensenius also claims that a gesture may have multiple functions. For instance, a performer's foot tapping has both a sound-accompanying function that follows the musical pulse and a communicative function in keeping up with the other musicians. Additionally, a flute player's arm-swinging and knee-bending represents their bodily engagement in attempting to express salient features of musical sound such as pitch, dynamic contour, and articulation (sound-facilitating gestures) as well as to convey those features to perceivers through visual actions (communicative gestures). The performer's breathing is another example; it is a sound-facilitating gesture (e.g., a quick breath before the excitation) and a sound-accompanying gesture (e.g., breathing along with musical pace).

Jensenius' classification of musical gesture suggests that gesture is related to musical meaning in various degrees depending on its function. Sound-producing and sound-facilitating gestures are involved in the quality of resulting sounds. On the other hand, communicative gestures and sound-accompanying gestures are concerned with the coordination and perception of musical sounds. For instance, listeners' gestures are often loosely articulated (e.g., open hands, body swaying, foot tapping, etc.), whereas performers' gestures are meticulously engaged in musical expression. It can be argued that performers' gestures are involved in musical expression more actively than are the

listeners. Clarke and Davidson (1998) consider sound-accompanying gestures less expressive than sound-producing and sound-facilitating gestures. They point out that a listener's *body sway* lacks musical expression although it reflects the listener's engagement with the music. Rather, it carries an "intuitive time-keeping role" and "linking function" across the phrase structure of music (Clarke and Davidson, 1998, p. 87). Therefore, sound-producing and sound-facilitating gestures are related to the performer's subjective interpretation. On the other hand, communicative and sound-accompanying gestures are concerned with the communication and representation of dominant musical features. In fact, sound-producing and sound-facilitating gestures are often combined to create a sound that consists of an attack point as well as a sustaining portion, in which various emergent qualities such as pitch, dynamic, timbre, etc. unfold. Figure 3-4 illustrates different categories of musical gestures organized according to how closely the gestures are engaged with musical meaning and intention.

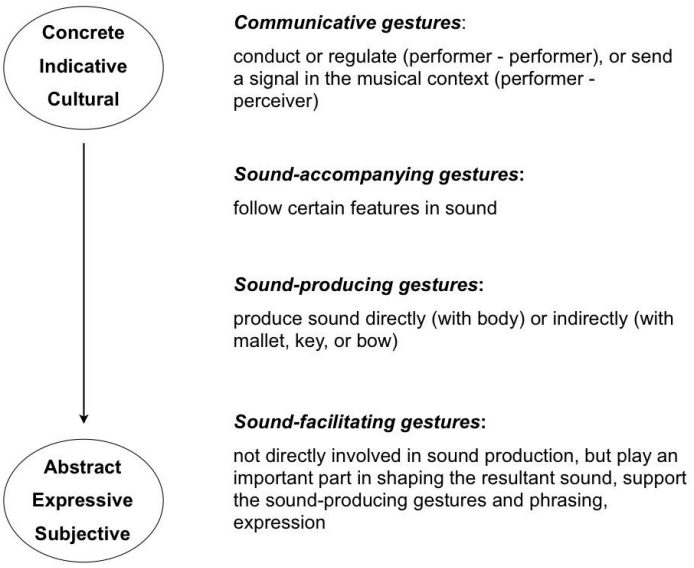


Figure 3-4. The functions of musical gesture arranged based on the level of indicative or expressive qualities. Sound-producing gestures are highly subjective and communicative gestures are highly indicative of cues rather than subjective.

Performative Gesture

Based on the above discussion of gesture based upon one's subjective and metaphoric interpretation of meaning, the notion of performative gesture is now proposed. The following discussion presents a quaternary model of musical gesture to illustrate the defining factors and qualities of performative gesture. Further, the relationship between the expressiveness of music and the human nature is presented, revealing the function of performative gesture.

Quaternary Model of Musical Gesture

As discussed above, gestures for speech and musical performance can be used for expressing abstract ideas and conveying concrete information. Metaphoric gestures express the agent's subjective perception and interpretation of essential meaning. Indicative gestures are clear and specific, using common signs and imitative actions such as the OK sign, knocking in the air, giving a cue, tapping to the musical beat, etc.

This dissertation puts forward a quaternary model based on the factors and qualities of musical gestures. Figure 3-5 illustrates the four categories of musical gesture defined by the factors, *Interpretation, Indication, Performer,* and *Listener*, as well as their qualities, *subjective* or *indicative,* and *creative* or *responsive.* The axis of Performer and Listener represent whether a gesture is generated by a performer for expressive creation or by a listener as a response to the expressed meaning. Although performers still perceive the sound they play, they are focused to a greater extent on the creation of musical sounds while listeners mostly perceive and respond to these sounds. This can be supported by the fact that performers' gestures are prepared in detail and each performer has a distinctive style, whereas listeners' gestures are spontaneous and less individual. The axis of Interpretation and Indication involve the

opposite qualities of gesture: subjective and metaphoric gestures are derived from the perception of an abstract meaning and objective gestures use culturally established symbols and signs.

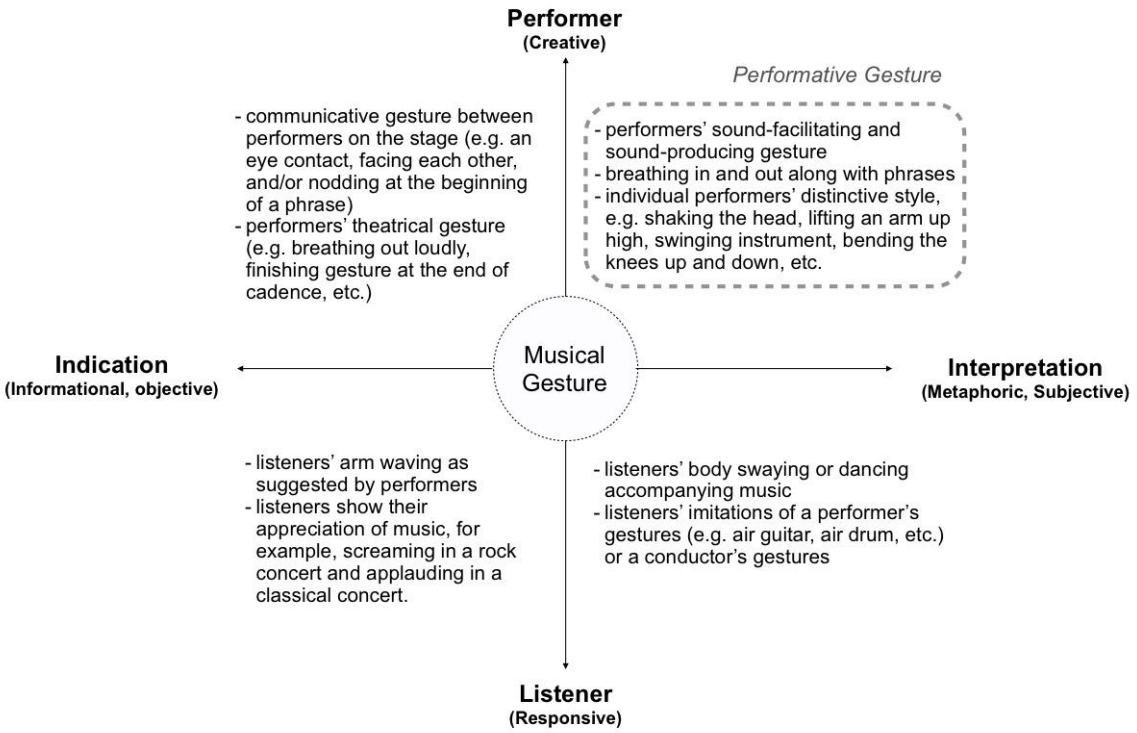


Figure 3-5. Quaternary model of musical gesture

Subsequently, musical gesture is categorized by a pair of two of these factors; *Performer-Interpretation, Performer-Indication, Listener-Interpretation,* and *Listener-Indication.* Performer-Interpretation is a category of gestures that reflects the performer's interpretation of musical meaning and expressive intention, such as gestures involving various modulations of a tempo, a swinging gesture with a clarinet for a sweeping pitch contour, breathing in and out along with a phrase, etc. The Performer-Indication category includes the performer's gestures created for communicating with other performers (e.g., nodding with a glance) and adding a theatrical message to the listener (e.g., a big gesture at the beginning of a climax or at a cadence).

The number of listeners' gestures is not as extensive as performers' gestures. Listener-Interpretation is a category of listeners' gestures made while listening to music that follows the salient features of music (e.g., tapping and dancing to music), therefore reflecting their perception of music. The Listener-Interpretation category also includes those gestures that are imitative of performing (e.g., air guitar, air violin) or conducting gestures, which demonstrate the listener's embodied understanding of music. The Listener-Indication category includes the gestures that are expressed by listeners toward performers or the performance but less related to musical features.

From the scope of this quaternary model of musical gesture, it can be argued that gestures in the Performer-Interpretation category are inextricably engaged with musical sound creation and modification, as well as with musical interpretation. In this dissertation, those gestures are defined as performative gestures. A performer's interpretation of a musical piece is derived from their perception of the piece. In order to convert their musical intention into actual sounds, performers endeavor to develop their motor skills to create the desired sound and expression. Through practice and rehearsal, performers achieve the proper gestural control for creating the intended sound; what is referred to here as a performative gesture. In this sense, performative gestures function as the bridge that connects a musical idea to the ideal sound. Thus, it is reasonable to argue that the essential musical quality is created by performative gesture. The following discussion inspects the multidimensional aspect of performative gesture and the way that musical ideas are transformed into performative gestures and then, ultimately, into musical sounds.

Expressiveness of Music and Performative Gesture

As seen in the quaternary model of musical gestures, performative gesture plays a critical part in creating expressive sounds in musical performances. A performer's interpretation of a musical idea is embodied in performative gesture; therefore the expressive quality of music is reinforced and increased. The following discussion demonstrates the close relationship between the expressive quality of music and the physical and psychological nature of human beings as represented in performative gesture.

Irregularity

Irregularity, which brings about the expressive quality of music, is intrinsic to the human body. Many researchers have identified the variable patterns of musical features as the source of the expressiveness in music:

> The deviation from the exact is, on the whole, the medium for the creation of the beautiful - for conveying of emotion (Seashore, 1937, quoted in Gabrielsson, 1985, p. 64)
>
> the alteration of musical features, with various degree and quality, is "what transforms sound into music" (Sandor, 1981, p. 3)
>
> (musical) compositions are often based upon incomplete, irregular, or imbalanced musical patterns that are developed and expanded during the course of the work (Barra, 1983, p. 29)

From the same point of view, Alf Gabrielsson (1988) points out that the mechanical regularity of music, in contrast to variability, causes a lack of expressive quality.

> A spontaneous response to music boxes, rhythm machines, and the like is that they sound mechanical, dead, and boring. The main reason for that is the mechanical regularity in their 'performance': absolutely constant tempo, and perfect ratio (1:1, 2:1, 3:1, etc.) between successive sound events (Gabrielsson, 1988, p. 41).

From this perspective, the irregular variation and development of musical features, and their resultant expressiveness, are regarded as an essential element of music. In musical performances, the expressive deviations of musical features vary depending on the performer's interpretation and intentional choice (Clarke, 1985).

Notation and sound

The discussion of music notation and its performed sounds illustrates how a human performer and performative gestures based on his or her interpretation create the extensive irregularities and varieties of musical expression. Music notation is the visual representation of a composer's musical intention. It is also a symbolic documentation that gives coded instructions for any performer to be able to produce the musical sounds the composer envisioned. In acoustic music, the creation of music is not complete until a performer transforms what's written in a score into the actual sound. Sandor (1981) also mentions that the performer's role is to recreate the sensation the composer intended so it can be experienced by listeners. In this sense, performers are the mediator between the composer's idea and the listeners' perception.

A performer may be creative in performing a piece of music. The limited information present in music notation allows performers to interpret the musical features of a piece. In addition, a performer's interpretation reflects their own musical background, intention and style, therefore creating a performance that is distinct, to some extent, from other performers. For example, performers can create a vast variety of tone color and intensity. Tone color and intensity are rarely, or only approximately, specified in a musical score; whereas other parameters such as pitch, articulation, and dynamics are represented explicitly (Palmer, 1997, p. 5). Skilled listeners can

distinguish certain performers by their interpretative style in terms of tone color, phrasing, etc.

Performers' interpretations reinforce, or even create, the expressive quality that is often missing in the systematic representations of musical scores. The expressiveness created by a performer at the time of performance is almost always lacking in a computer-generated performance of the same musical piece. Although computer-generated performance is "an exact agreement with what is nominally given in the music score" (Sundberg, 1988, p. 53), it can have insufficient expressive quality. Comparing a music score with its performances by human performers as well as those by computers, Johan Sundberg argues that an essential quality exists that is not present in music scores but is created by human performers and not by computers:

> This implies that the discrepancies between the sound sequences shown in the music score and those really generated in music performance constitute an essential part of music communication: the discrepancies between notation and sound must be in some sense meaningful, that is they carry information which the listener needs in order to enjoy listening to the performance (Sundberg, 1988, p. 53).

The reason could be that most computer sequencing programs are not equipped to translate musical terms, such as *rubato* or *cantabile*, into any meaningful change in the sound. Including Sundberg's (1988) research, many researchers have revealed the way human performers convert information presented in musical notation into expressive sounds, in order to construct a computational model for expressive performances (Clarke, 1988, Todd, 1985, 1989, 1992 & 1995). Further, some sequencing programs such as Cubase have developed flexible quantizing options to achieve the effects of *swing* or *humanized* performance.

Sundberg (1988) investigates musical performances by human performers as a means to create the rules for improving the expressive quality of computer-generated performances. Comparing the acoustic signals of performances by human performers with the musical scores, Sundberg recognizes that the combination of flexible timing and altered dynamics reinforces the expression of musical structure, motion and emotion. Sundberg's findings through observations are as follows: 1) the contrast of duration, dynamics, and pitch is amplified, 2) unexpected tones and harmonies are emphasized, 3) the structure of the melody is pronounced clearly through appropriate timing, and 4) performances are embedded in an emotional atmosphere (p. 64-65). According to Sundberg's observations, it can be suggested that the expressive quality of musical performances is created by overstating the difference between musical features. For example, the amplified contrast of durations is achieved by playing a short note shorter and a long note longer. In the same way, playing a soft dynamic softer and a loud dynamic louder can highlight a dynamic contrast. Emphasizing unexpected tones and harmonies increases the contrast between anticipation and surprise, thereby stressing the irregular quality of musical progressions. The exaggerated contrast resulting from overstating musical features creates a greater range of expression via irregular deviations.

Expressive timing

Expressive timing is a great example of the irregularity of musical features created by a human performer. Sundberg (1988) argues that timing, meaning the various alterations of tempo, is one of the most noticeable discrepancies between music notation and the sound created by human performers. Gabrielsson (1988) argues that human performers have complete control over tempo and timing of musical events

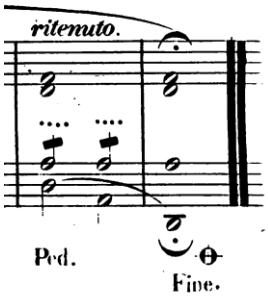
throughout a piece of music, therefore influencing “the *structural*, the *motional*, and the *emotional* aspects of music experience” (p. 30).

Comparing musical performance with speech, Berman (2000) argues, “a performer should develop the ability to recognize and differentiate between commas, semicolons, and periods in music” (p. 240). In other words, an expressive performance can be achieved by enunciating musical events and their structural hierarchy. As Gabrielsson (1988) argues, with expressive timing, performers can articulate the duration of notes and rests clearly, for example, *legato* or *staccato*, and emphasize the tensional contour of each phrase or period, such as beginning, climax, and resolution. For instance, a performer may introduce a new phrase by breathing in, just as one quickly takes a breath before a sentence in order to avoid pausing in the middle of the sentence. In this manner, a slight delay is created at the beginning of the phrase, and the division of musical thought appears naturally clear to listeners. Depending on the hierarchy of structural entities, the flexibility of timing varies. A *ritardando* at the end of a piece is expected to be more dramatically articulated than one at the end of a phrase.

Each performer can create different timings of musical events that may result in different musical expressions based upon their musical interpretation. Figure 3-6 illustrates that the *ritardando* in the last two measures of Prelude Op. 28 No. 15, by Chopin, was played differently by four pianists, Vladimir Horowits, Martha Argerich, Valentina Igoshina, and Ferruccio Busoni. Figure 3-6B shows the durations between the bass notes (Db3, Ab2, and Db2) as well as the ratio between those durations performed by each pianist. Though the durations of the whole piece performed by Argerich and Busoni are almost the same (i.e., 4 minutes 50 seconds by Argerich and 4 minutes and

46 seconds by Busoni), Argerich played the *ritardando* longer than Busoni by spending more time between the last two bass notes (from Ab2 to Db2). On the other hand, Horowitz and Igoshina played the *ritardando* in a similar pace, it should be noted that the total duration of Igoshina's performance (6:43) was much longer than that of Horowitz's (5:10). Comparing the durations of the *ritardando* with the durations of the performed piece, it can be argued that Argerich created a more flexible and dramatic *ritardando*.

A) The final two measures of Prelude Op. 28 No. 15 by Chopin



B) Different timings between four pianists

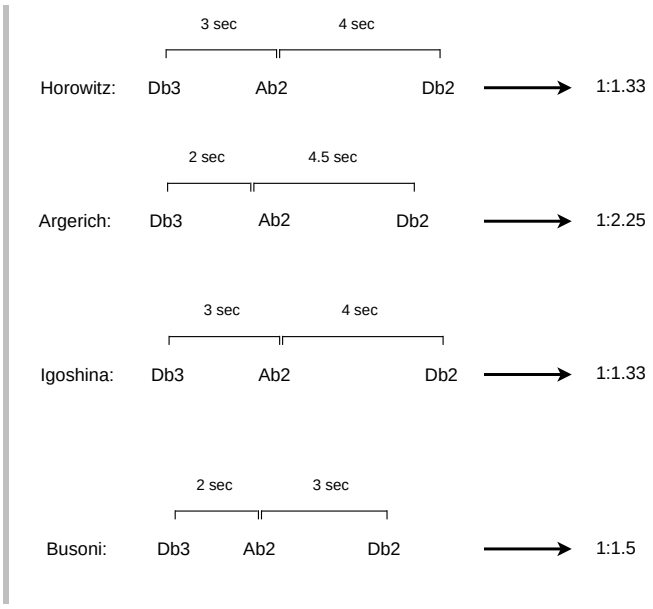


Figure 3-6. The rendition of a *ritardando* varies depending on the performers. (A) The notation of the last two measures of Prelude Op. 28 No. 15 by Chopin, (B) the various paces over the bass notes of the *ritardando* created by Vladimir Horowits, Martha Argerich, Valentina Igoshina, and Ferruccio Busoni.

Variations in tempo also affect the perception of motion and its pace. Gabrielsson (1988) argues that tempo is related to “experienced motion” (p. 34). A stable tempo is perceived as regular forward motion; a varied tempo is perceived as ongoing motion with a fluctuating pace, for example, a tempo that is held back almost to a stop and then accelerates to the original tempo. The connection of tempo to motion is also found in the description of the tempo marking *andante*, which represents *walking* tempo or *at a walking pace*. Other tempo markings such as *allegro*, *presto*, and *largo* can be interpreted as a brisk walk, a fast run, and a leisurely walk. A varied tempo according to the tension and energy of musical flow can also evoke emotion in listeners’ minds. For example, the increasing tension as one approaches the climax of a phrase is often realized by accelerating the tempo and increasing the dynamic, and resolved by decelerating the tempo and decreasing the dynamic. It should be noted that the expressive and variable timing derived from a performer’s interpretation gives rise to the sense of motion and emotion, which can be easily attributed to the human body and mind. The following discussion demonstrates that the expressive quality created by flexible timing in music is similar to the human’s physical limitations as well as expressive intentions.

Human nature and gesture

In musical performances, human performers manipulate tempo and timing based on their musical intentions. Compared to computer-generated performances, performances by human performers are more expressive, but less accurate. The irregular quality of musical expressions is created by a performer’s musical intentions. The reason is that performative gesture is derived not from a music notation but from a performer’s interpretation of the notation. In addition, performative gesture is affected by

the nature of human body. The unstable, erroneous, and imperfect nature of performances by human performers are related to the physical limitations of human beings, who are not able to perform a piece of music exactly as written in the score. An example of the physical limitations of human performers is found in the fact human performers cannot play an exact, endless repetition of musical material (i.e., a loop) which can be easily generated by computers. They need to take a moment out of the musical flow, however briefly, to place their arms for a large leap, unwind their strained muscles, or breathe. Even an exceptional performance of minimalistic music does not have the high-level preciseness of tempo control when compared to the mechanical rendition by a computer.

It can be argued that performative gestures, which are based on a performer's interpretation (mind) and conditioned by a performer's physical ability (body), play a critical role in creating the irregular, expressive quality of music. Bruno Repp's (2001) view is in line with this argument. Donald Barra (1983) also draws attention to a performer's gestures as the key technique to creating vibrant musical expression:

> The specific techniques used to create an expressive performance … depend upon the ability of the performer to create a vibrant, living presence within the music. It is based upon his ability to create a series of goal-oriented actions that develop within a single, unified, organic musical impulse. (Barra, 1983)

Barra (1983) recognizes a performer's goal-oriented action as an essential part of achieving expressive performance. Goal-oriented actions, which are deliberately involved in creating and modifying sounds based on a performer's musical intention, are considered synonymously as performative gestures. Supporting this point of view, Alexandra Pierce (2007) also uses "focused movement," referring to the highly

controlled gestures of a performer, or performative gesture, as a critical method for intensifying musical expression (p. xiii):

> Focused movement gives an audible playoff in a performer's sound. … Melodies become more shapely, their energy more varied; phrases become articulate and coherent; arrivals at cadence reach into an embedding stillness; the rhythmic pattern of middleground harmonic progression brings life into phrases, and so forth. The movements are suggestive for technique, and often they can be translated directly into playing gesture and singing. They become part of your technical command (Pierce, 2007, p. xiii).

Pierce (2007) provides examples of gestures, such as hand stretch and arm-arching to shape phrases and achieve climax, that show the performer's conscious body control needed to create the intended expression. Certain gestures are directly related to a playing technique. For example, during a piano performance, a gesture involving quick movement with a rigid hand-frame is often used for playing a chord progression marked *marcato.* Also, flexible wrist and elbow movements are employed in playing an *arpeggio* passage. These examples are in line with Clarke and Davidson's ideas (1998), who argue that performers' gestures reflect the character of a performance, such as *marcato*, *leggiero*, etc.

Performative Gesture as a Corporeal Interpretation

Performative gesture is a corporeal bridge between a musical idea and its actual sound. The performer's expressive intention is transformed to the actual sounds by employing performative gestures, which are deeply grounded in the nature of a performer's body and bodily movements. Figure 3-7 illustrates that an abstract musical idea is transformed by performative gestures into the actual sound with the sense of motion and emotion, therefore giving rise to the sense of a human body as performative agent.

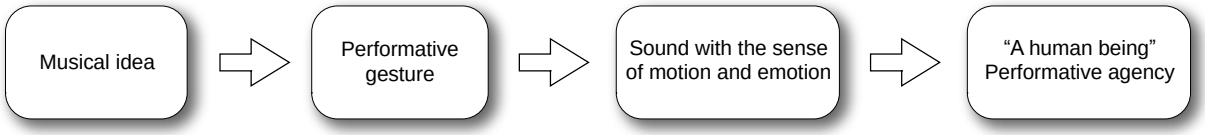


Figure 3-7. Realization of a musical idea as the actual sounds by performative gestures, the corporeal articulations of the musical idea

Not only is a performer’s musical interpretation embodied in performative gestures, but performative gesture also strengthens a performer’s musical cognition through musical imagery. As opposed to abstract musical ideas, gestures are physical, therefore providing a link to multidimensional perceptions such as vision, space, time, etc. McNeill (2000) refers to gestures as “imagery, actional, and visuo-spatial” representations of a meaning (p. 139). Gestures also take place over a period of time, therefore creating a form, in other words, the initial shape of a gesture and its progress through a spatial-temporal trajectory. The visuo-spatial components of musical gesture are related to performance space that defined the performer’s movement possibilities. Lutz Jäncke (2006) argues, “professional musicians automatically practice spatial functions while performing music” (p. 35). While constantly coordinating their bodies with an instrument in order to play music, a performer becomes aware of the space specified in relation to the structural features of the instrument and performer. Laban (1963) defines this space as a *kinesphere*, “a mental construct that we are always aware of in our interaction with the environment and with others” (as cited in Jensenius, 2007, p. 44). While sight-reading a piece of music, professional performers are able to position their body parts for any notes or passages effortlessly. A performer’s capacity of using a visuo-spatial trajectory is established by their long-term experience of performance. Leman (2008) argues, “the sensation of his own body movement builds

up an internal model of movement trajectory, based on the sum of motor activity in memory" (p. 85).

A performer's embodied experience of creating musical expressions during rehearsals and performances establishes the cognitive connection between a sound and its multimodal perceptions. Therefore, a performer's perception involves multimodal representations of musical sound (i.e., auditory, visual, spatial, motor, and kinesthetic perceptions) derived from the visuo-spatial trajectory of gestures, as illustrated in Figure 3-8. This multimodal links of musical cognition can improve a performer's ability to utilize musical imagery for better quality performances. This is because musical imagery is easily realized through gesture-related memories. For example, a musical passage can be imagined through memories in various modalities, such as visual memory of the passage on a keyboard, kinesthetic memory of hand positions and finger tensions while performing the passage, etc. (Zatorre and Becket, 1989).

Mariko Mikumo (1994) presents various strategies to retain a melody, such as spelling note names (verbal), singing the notes (auditory), imagining the notes on a keyboard (visualizing), and finger-tapping the notes as if playing the piano (motor). Mikumo also indicates that these pitch-encoding strategies are interrelated, which means that the finger-tapping the notes can activate the auditory perception of the notes as well as the visual perception of the notes on a keyboard. From these findings, it can be argued that gestures, which incorporate various perceptions, can be the key to achieving the perception of music as a multimodal musical image. For this reason, during performance, performers can imagine a clear idea of a piece, a sound, a musical idea and intention, etc., in advance, through the continuous employment of performative

gestures established during multiple rehearsals, therefore improving the quality of performance.

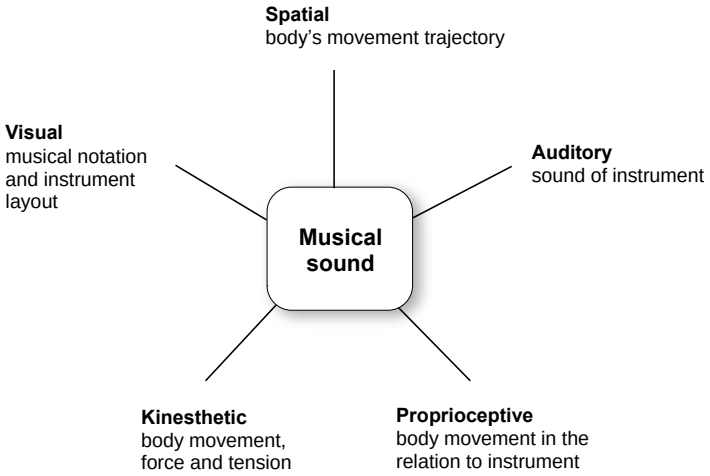


Figure 3-8. An illustration of the multimodal nature of musical representation

Using visual and spatial gestures as a physical method for realizing a musical idea with expressive sounds, performers tend to interpret musical features as physical characteristics that can be related to the human body. Many researchers have argued that musical tension and energy can be understood as a physical being in motion (Barra, 1983; Sandor, 1981; Berman, 2000). Interpreting musical characteristics as imaginary objects, a performer can mentally simulate imagined objects in motion and come up with the appropriate performative gestures to express the characteristics of the imagined object in the actual sounds. Barra (1983) suggests that performers may apply Newton's Second Law of Motion to understand and realize musical motion, for example, a heavy, big object moving more slowly or a light, small object moving more rapidly. Based on the quality of imagined objects attributed to musical ideas, performers can create gestures that effectively illustrate how these metaphorical objects might behave, therefore improving the expressive quality of musical performance.

Virpi Kalakosky (2001) argues “mental imagery is a medium for simulating perceptual properties of the external world” (p. 44). In research about the brain and cognition (Berthoz, 1996; Pellegrino et al., 1996; Annett, 1996; Decety, 1996), it has been observed that the same neural substrate is activated not only when one executes an action but also when one perceives or imagines the action. This implies that a mental simulation of perception shares structural similarities with actual perception (Finke, 1985). Therefore, perception of an object can be regarded “as imagining the actions that are implied in using the perceived objects” (Reybrouck, 2001, p. 120-121). As this research shows, one’s psychological experience of perceiving a sound is similar to that of imagining the sound. If so, it can be argued that a performer can also imagine the gestural quality that can be attributed to an imagined sound, depending on their perception of its shape and intention.

CHAPTER 4
ILLUSTRATION OF PERFORMATIVE AGENCY IN ACOUSMATIC MUSIC

Introduction

In the previous chapters, the idea of music cognition via embodied reasoning was discussed, in which musical sounds are perceived in relation to bodily movement, based on the listener's multimodal experience of the physical world. Supported by the view of embodied cognition, the body's movements are perceived as causal actions of sounds and the focus of discussion moved to a human performer's gestures, which are the most focused bodily movements for creating musical sounds. It was argued that the irregularity that entails a significant range of deviations and contrasts of musical features creates expressive quality, therefore bringing about the sense of human motion and emotion. It was further argued that expressive quality in musical performances by human performers, opposed to computer-generated performances, result, at least in part, from the physical limitations of human beings to create precisely consistent expressions. Based on the perceptual connection between irregularity and a human performer, it is possible for a listener to conjure up a metaphoric image of the performative agent as well as performative gestures from the expressive quality in acousmatic sounds. In this chapter, *PianoForte* by Yu-Chung Tseng, a musical example of performative agency in acousmatic music is presented, focusing on the gesture and its expressive quality that is manifested in musical sounds.

The Corporeal Interpretation of Gestures in *PianoForte*

PianoForte by Yu-Chung Tseng is distinguished by the exclusive use of piano sounds as its only sound source. Tseng (2010) states, "the idea of limiting sound source and samples in small fragments is to work closely with the sounds, to explore the

possible transformations of sound and to develop unique timbres and musical gestures" (PianoForte, para. 1). This piece progresses through various combinations of the characteristic timbre and gesture of the piano, creating a sense of tension and release, force and movement, and performative agency.

The primary sound materials of *PianoForte* consist of two categories: pitched sounds from the keys and strings and non-pitched sounds from the other parts of the piano (i.e., the soundboard, metal frame, etc.). Through multiple processing techniques, the distinctive piano sounds are transformed into sounds with timbres that are hardly recognizable as being related to the piano (e.g., metallic sounds, noises, voice-like sounds, water-like sounds, etc.). At first, the evident presence of the piano in *PianoForte* may draw one's attention to the general setting of a piano performance, conjuring up images of the instrument, performer, venue, musical style, etc. However, the use of small fragments of piano sounds and their timbral variations allows for the perception of only abstract acoustic features and brackets out the implications of a piano performance. Any reference of the sound material to cultural, social, or other extra-musical contexts can be masked.

While the limited sound materials suggest a narrow focus on timbres, the distinctive gestures, heard in the sounds' amplitude profiles or energy profiles, allow for the possibility of reference to physical actions. The two characteristic yet contrasting gestures employed in *PianoForte* are as follows: 1) iterative gestures of percussive, repetitive sounds and 2) "stretching" gestures of reversed piano sounds. The detailed relationship between these gestures and their correlated imagined physical objects and actions is presented in the later part of this chapter.

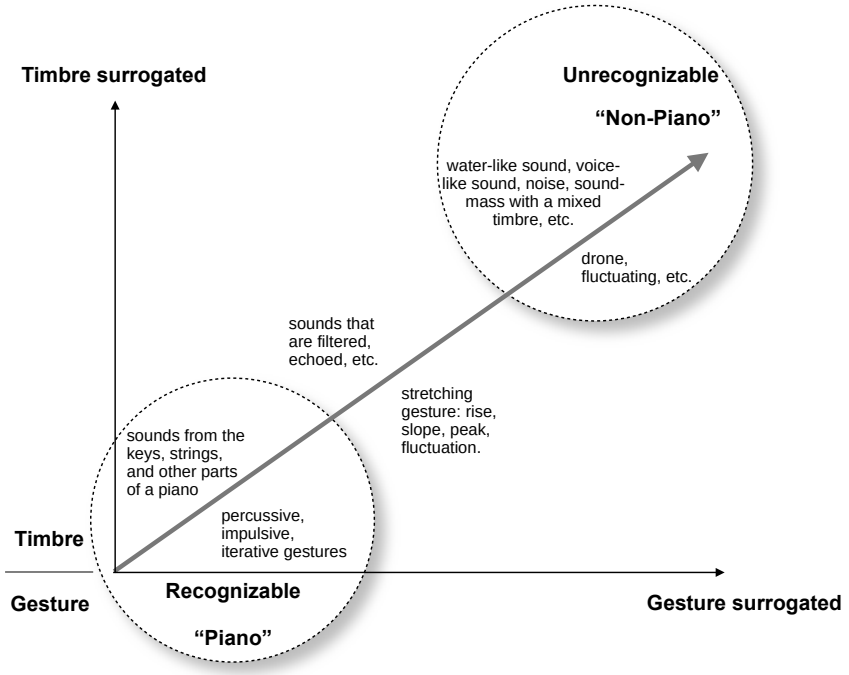


Figure 4-1. A perceptual framework suggested for *PianoForte* based on the timbre and gesture as well as their relations to the piano

Based on the aspects of gesture and timbre, a perceptual framework for *PianoForte* can be suggested based on the piano sound as the basic sounding model, as illustrated in Figure 4-1. The axis of timbre shows that the distinctive piano timbre is immediately recognized in the sounds achieved from the keys and strings. However, the timbres on the other end of the axis, which are similar to streaming water, a voice or chorus, noise, a sound-mass with a mixed timbre, etc., are almost unrecognizable as piano timbre. Ambiguous timbres, such as the various filtered sounds, invite the listener to trace or imagine how the timbres are derived from the piano sound. In the axis of gesture, the iterative gesture obtained from percussive and impulsive sounds is recognized as native to the piano sound. Though the stretching gesture can be a bit ambiguous, it can be recognized as a reversed piano sound, therefore establishing the relationship with the piano. The steady drone and fluctuating sounds are barely

recognizable as related to the piano. It is possible that the timbre of a sound is recognizable while the gesture is ambiguous or unrecognizable, and vice versa. A sound created by stretching the sustaining part of a piano sound is an example where the timbre is recognizable while the gesture is ambiguous.

Types of Gesture

The following discussion describes the basic forms of the iterative and stretching gestures and their variations. Based on embodied cognition, where a sound and its gesture can be understood by one's experience and knowledge of a physical object and its movement, the energy-motion property of a gesture is interpreted as the kinetic energy of an imagined physical object, resulting in corporeal sensations of musical sounds.

Iterative gestures

An iterative gesture is characterized by the repetition of a percussive envelope, which has a short attack and decay time and no sustain. The *striking* action producing this percussive sound is easily identified, based on one's knowledge of the link between an action and the resultant sound's amplitude profile. On the piano, an iterative gesture can be created by a series of striking actions on the keys, strings, or other surfaces through direct contact with the body (e.g., fingers, hands, etc.) or indirect contact using other implements (e.g., sticks, mallets, etc.). As one can imagine the striking actions and objects (hands or mallets) behind an iterative gesture, various forms of an iterative gesture employed in *PianoForte* can be understood in terms of physical object and causal action.

While the iterative gestures employed in *PianoForte* vary in the length, speed, and timbre, they can be divided into two types, *increasing* and *decreasing*, according to

the dynamic shape. Figure 4-2A illustrates an example of the *increasing* iterative gestures at 1:16 in which the rate of pulses accelerates and the intensity increases through recurring pulses. This increasing iterative gesture can be perceived as resulting from a series of striking actions that carry out an accelerando and a crescendo, therefore giving a sense of forward motion. As opposed to the increasing iterative gesture, the example of *decreasing* iterative gestures in Figure 4-2, from 1:16 to 1:18, has a decreasing intensity and rate of repeating pulses, which creates a sense of fading away. The energy profile of the decreasing iterative gesture can be compared to the way that an object that is dropped on the ground springs back for a certain amount of time. For example, a table tennis ball dropped or thrown on the piano strings will produce a decreasing iterative gesture as the ball bounces around on the strings until the ball ceases to bounce. Note that a parallel can be drawn between a sound and a physical object that might create a movement similar to the dynamic gesture of the sound.

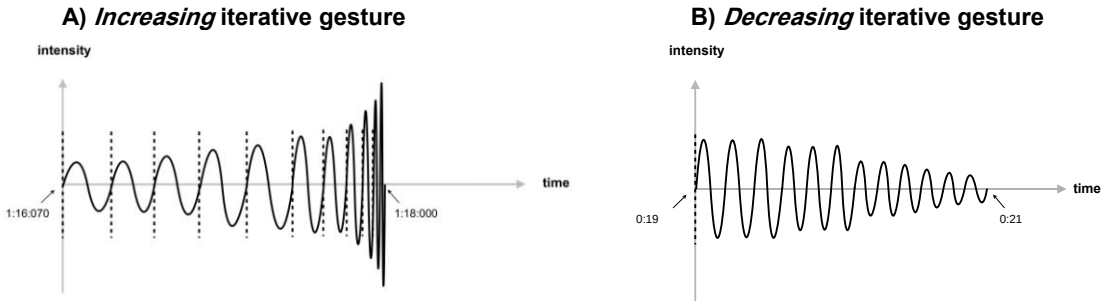


Figure 4-2. Two types of iterative gestures based on the dynamic shape. A) Increasing iterative gesture. B) Decreasing iterative gesture.

The difference between the energy profiles of the increasing iterative gesture and the decreasing iterative gesture stems from the difference in their imagined causal actions. The dotted lines in Figure 4-2A and Figure 4-2B represent the excitations

applied to create the gestures. This shows that each pulse of the increasing iterative gesture is perceived being initiated by a striking action, because the creation of accelerando and crescendo requires increasing force and speed for each action. Based on the above example of a table tennis ball, it is possible to argue that only the initial pulse of the decreasing iterative gesture is created by a striking action and that the remaining pulses are produced as reactions to the initial excitation.

Stretching gestures

Stretching gesture refers to the amplitude contour of a reversed piano sound, in which parameter stays on a steady level for a while and rises toward the end. The term *stretching* gesture is used to denote the quality of a stretched string or rubber band, the elasticity of which might create a tension profile that is similar to the energy profile of a reversed piano sound. While the rising portion of the stretching gesture has a great deal of movement, the steady portion is relatively restrained in terms of movement. In other words, while the rising portion can be perceived as analogous to an actual, physical gesture, the steady portion can be perceived as a symbolic, musical gesture of resistance against the nature of sound, movement. Especially in *PianoForte*, which contains a soundworld that is undeniably characterized by the piano, the natural dynamic shape of a piano sound is expected in the listener's mind: the strong attack, sustain, and decay. Therefore, it can be argued that tension arises from the steady portion of the stretching gesture, perceived as restraining the natural tendency of motion. Figure 4-3 shows examples of the various stretching gestures employed in *PianoForte,* with different degrees of increasing energy. The variations of the stretching gesture can be viewed as illustrating the various ways of unleashing the energy that has

been restrained over the steady portion of the gesture. The level of increasing energy ranges from a slight rise to drastic rise.

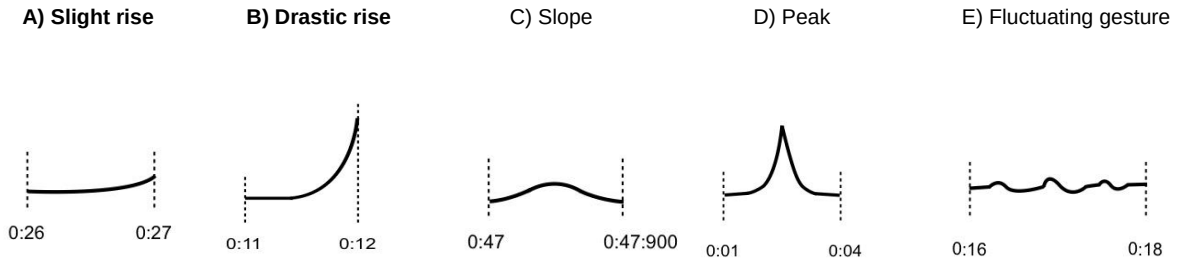


Figure 4-3. The variations of stretching gesture representing the tendency of motion. A) Slight rise. B) Drastic rise. C) Slope. D) Peak. E) Fluctuating gesture.

The stretching gesture with a *slight rise* of energy (Figure 4-3A) is created by reversing a piano sound with a soft attack. The stretching gesture with the *drastic rise* of energy (Figure 4-3B) creates the sense of reaching toward a maximum level of energy and tension. The *slope* gesture (Figure 4-3C) is the combination of a stretching gesture with a slight rise and its reversion. The *peak* (Figure 4-3D) is the combination of a stretching gesture with a drastic rise and its reversion. While the slope and peak gestures give an impression that the increased tension resolves, the slight or drastic rise gives a sense of a sudden interruption of the energy flow. The fluctuating gesture in Figure 4-3E represents a combination of multiple slope gestures with less energy.

Configuration of gestures

The above discussion of the iterative and stretching gestures demonstrates how the gesture represented in the energy shape of a sound can be understood by imagining a correlated physical object and its movement. Based on this viewpoint, the following discussion goes into the details regarding the perception of combined gestures.

Combination of successive gestures

The basic combination of gestures in this piece is created by placing the stretching gesture after the iterative gesture. Figure 4-4 illustrates the combination of a stretching gesture with a drastic rise and an iterative gesture, which is frequently employed in *PianoForte*. In this combination, the gestures are perceived as causally related, in which the restrained energy from the steady part of a stretching gesture reaches its maximum level and then is released through the active movement of an iterative gesture. This can also explain how a stretching gesture with a steep rise that is not followed by an iterative gesture can give rise to a sensation of uneasiness resulting from the unresolved energy. The dotted line in Figure 4-4 represents the threshold where the restrained energy turns into dynamic movement. The energy contour of these combined gestures contains a rise carried by the stretching gesture in a restrained manner and a fall carried out by the active, iterative gesture.

These combined gestures can also be understood by employing one's knowledge of physical objects and their movements, in the same way that the individual gesture was interpreted. An example of an energy profile similar to these combined gestures can be found in a ball held back by an elastic rubber band. Once released from the rubber band, the ball flies into the air and bounces off multiple surfaces. In this example, the stretched rubber band is understood to be the causal action that leads the ball to move in a shape similar to that of the combined gestures. Imagining the rubber band causing the ball to move, the listener's attention naturally moves toward *who* or *what* stretches the rubber band and *why*. The thing that applies the force to draw the rubber band back can be perceived as the causal agent who intends to create the ball's movement. As the physical object and its movement are perceived as resulting from the

agent's intention, the agent can also be conjured up as the creator of these combined gestures.

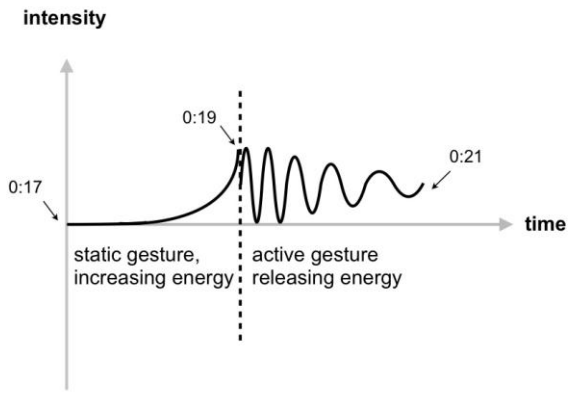


Figure 4-4. A basic combination of the stretching and iterative gestures: the energy restrained in the steady portion of the stretching gesture is increased then released through the active movement of the iterative gesture.

Variations of these combined gestures are employed throughout the piece. Based on the interpretation of energy-motion forms in terms of objects (e.g., rubber band, ball) and environment (e.g., surface), various factors causing changes in the energy-motion of a sound can be considered. For example, the elasticity of a rubber band, the force applied to the rubber band, and the materials of the ball as well as the surfaces can affect the resulting energy-motion form. The more elastic the rubber band is, the farther the rubber band is stretched, therefore creating more tension and energy of the rubber band to resume its original position. As a bigger force is applied and/or as the rubber band is held back longer, the ball will bounce much higher and longer unless the ball is made of wood or cotton. A rubber ball, undeniably, bounces for a longer period of time than a plastic or glass ball, which stops bouncing quickly or breaks immediately. The duration between each bounce, as well as the rate of bounces, vary depending on the materials of, and the distance between, the surfaces. There may also

be a case in which the ball bounces only once regardless of the abovementioned attributes. For instance, if a ball bounces off the ground then somehow ends up going upward beyond the reach of the earth's gravity, it will not bounce again. This is a creative example that would never happen in reality but can be imagined as an extension of one's lifetime physical experience and knowledge. These examples signify that, based on one's ability to interpret a sound in terms of an imagined physical object and its movement, new types of physical movements can be created in one's mind while attempting to understand surrogated gestures.

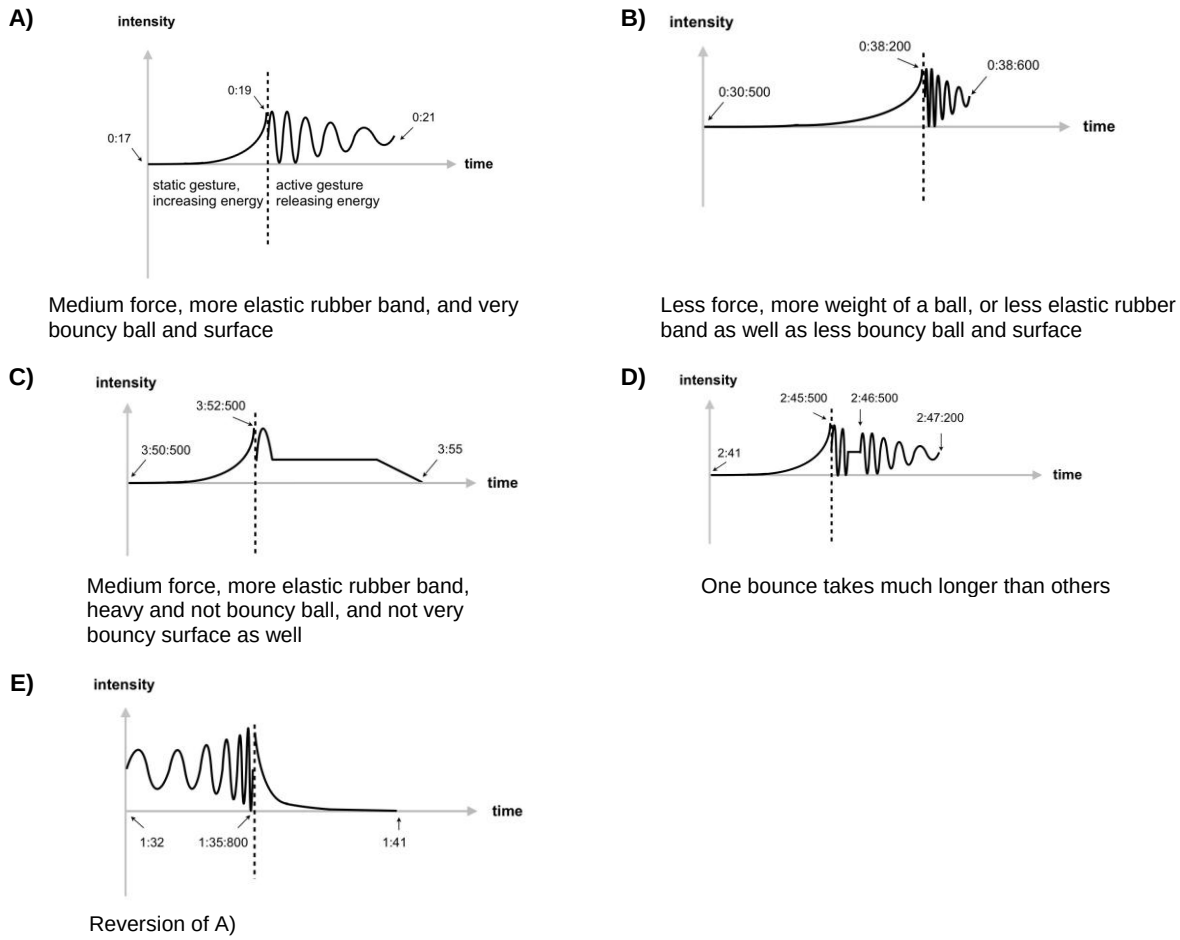


Figure 4-5. Various energy profiles of the combined gestures perceived as the results of different factors, such as the causal force, the material of objects and surfaces, etc.

Various energy-motion forms employed in *PianoForte* are illustrated in Figure 4-5. Figure 4-5A is characterized by a very active iterative gesture that lasts over a longer period of time than the other examples. Figure 4-5B shows the combination of a stretching gesture with a longer steady portion and a quick, decreasing iterative gesture. Compared to Figure 4-5A, the longer period of steadiness in Figure 4-5B implies a weightier object, less force applied to an object, or less elasticity in the rubber band. According to the principles of physics, it takes longer for a heavier object to get into motion with the same given force. Therefore, the energy of the stretching gesture that increased over a longer duration is expected to be resolved through the iterative gesture over a longer period of time as well. However, the quickly disappearing iterative gesture counteracts that expectation and is perceived as an unpredicted twist, or irregular feature, therefore creating an interesting or expressive quality to the sound.

The variations illustrated in Figure 4-5C and 4-5D are also seen as modifications of the basic energy profile in unpredictable ways. In Figure 4-5C, the increased energy of the stretching gesture is released through a single impulse sound instead of an iterative gesture. Although not the same as an iterative gesture, an impulsive gesture can be thought of as a type of iterative gesture, in the sense that an iterative gesture consists of recursive pulses. As illustrated in the above example of a ball flung into the universe after only a single bounce, an impulsive gesture can be perceptually related to an iterative gesture. Figure 4-5D illustrates an iterative gesture, one of whose pulses is elongated, creating an unexpected change in timing. In Figure 4-5E, the basic energy contour of these combined gestures is reversed. The energy that rises through the

articulated movement of iterative gesture fades away immediately with a reversed attack creating a perception of contrast.

Juxtaposition

Juxtaposition of the stretching and iterative gestures has reinforcing effect, since the stretching gesture is used for the overall shape of a sound, while the iterative gesture creates a sense of inner movement. Figure 4-6A shows an example, in which the stretching gesture with a rise is juxtaposed with the increasing iterative gesture, therefore strengthening the perception of increasing energy and movement. Figure 4-6B illustrates an example in which the iterative gesture and the stretching gesture with a slope are juxtaposed. Juxtaposing these two contrasting gestures simultaneously creates a more elaborate texture in which musical tension and expression may be more strongly articulated. The juxtaposed gestures, along with the successive combinations of gestures, create gestural variety in *PianoForte*.

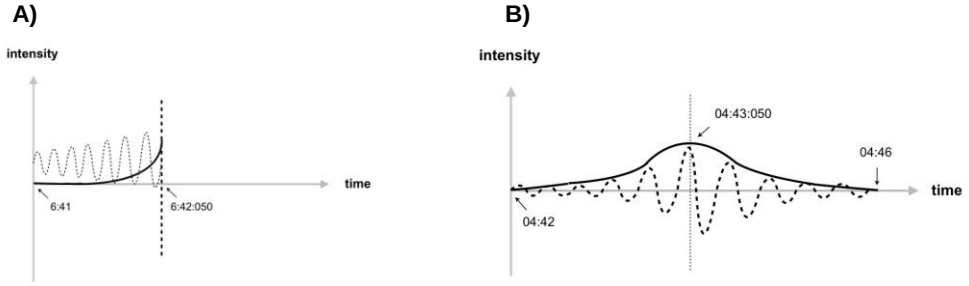


Figure 4-6. Juxtapositions of stretching and iterative gestures. A) Rising energy in both stretching and approaching iterative gestures. B) Stretching gesture with a alope and its inner movement created by iterative gesture.

Other Relationships with Timbre, Frequency, and Texture

In *PianoForte,* certain types of gestures and timbres are favorably paired. For example, the metallic noise with a high frequency is frequently used with a static gesture and a drastic rise and/or fall in dynamics. Pitched sounds appear in the shape

of a strong impulsive gesture or an iterative gesture. Especially in the beginning of the piece, these sets of gestures and timbres are clearly perceived, creating a sense of interaction between two groups of gesture-timbre unity. However, these predetermined sets of gesture and timbre vary as the piece unfolds. For example, a stretching piano sound precedes an iterative metallic noise, creating a contrast with the combination of a stretching noise and an iterative piano sound. This cross-relationship takes place in relation to frequency and texture as well. The sounds that contain contrasting directions between their elements (i.e., up and down, forward and backward, etc.) are exemplary. Examples include the sounds (from 3:29:500 to 3:31 and from 3:36 to 3:37:500) in which the energy increases while the frequency moves lower and the timbre becomes darker. Similar to the Doppler effect, this example brings about the perception of an object approaching to the perceiver, creating a sense of physicality.

The Relationship with Performative Agency

Listeners can easily imagine physical objects and their movements from the characteristic gestures used in *PianoForte*. The physical characteristics in a sound invite the listener to employ his or her experiences with objects in the real world. In *PianoForte*, the various gestural features of the piano sounds motivate the listener to search his or her experience and knowledge of physical activity, the movement of which may be similar to the sound's gesture, as in the above examples of a table tennis ball and a rubber band. This physical correlation leads the listener to interpret the gestural features of a sound as kinetic features, containing energy, motion, intention, and performative agency.

Variations of the basic energy contour of combined gestures that include unexpected features incorporate irregularity into the basic paradigm and create an

expressive quality. From Sundberg's (1988) observations of the expressive quality in musical performances (see Notation and sound in Chapter), it was implied that overstating the quality of, and the difference between, musical features, is a way of reinforcing the expressiveness of music. In this context, those variations of combined gestures in the above discussion are seen to be contributing to the expressive quality of *PianoForte.*

In these gestural variations, one can conjure up an image of an agent behind the object to whom the intention of the causal action might be attributed. Supported by the expressive quality implied in the gestural variations, one can envision a human being who is making an effort with these deliberately created performative gestures in order to attain the intended result.

Detailed Listening of *PianoForte*

A detailed listening of *PianoForte* is now presented, focusing on the previously discussed gestures and their physical correlations. In addition, the way in which the sense of musical tension, narrative, and performative agency emerge from the varieties of gestures and timbres evolving through the piece is discussed, along with the structure of the piece and its subsections.

Overall Structure

PianoForte is organized into four sections that are similar to the typical structure of the traditional Chinese Poem: Introduction, Development, Turn, and Conclusion. The only difference is that *PianoForte* has a brief bridge inserted between the Introduction and Development. In modern times, this structure is also employed in other genres of the arts, such as literature and architecture. This structure seems to fit the strong drama of *PianoForte*. The musical content and characteristics of each section are listed below.

Table 4-1. The four-part structure of *PianoForte.*

Introduction (0:00-1:48)	5 phrase structure Slow introduction of characteristics gestures and timbres
Bridge (1:48-2:19)	Pattern reminiscent of the Introduction Gradually leading to the Development
Development (2:19-4:27)	Dominance of the iterative string sound Dense texture Formation of complex entity through timbral transformation
Turn (4:27-6:33)	Static and iterative gestures become fused Sounds merge into a complex entity
Conclusion (6:33-8:32)	Continuous sound in background Material from the beginning revisited Closing punctuation with the material from the beginning after a brief break

Introduction (0:00 to 1:48)

This opening section is composed of five sounding events occurring at varying intervals, as illustrated in Figure 4-7. These sounding events are followed by a brief silence or quasi silence (i.e., very soft residual noise) comparable to musical phrases separated from one another by a rest or breath. The piece unfolds slowly over the phrases, employing the interplay between contrasting gestures (i.e., stretching and iterative gestures) and timbres (i.e., piano and noise). Each timbre is introduced, one at a time, the gesture is slightly more developed at each phrase, and the duration of each phrase gradually increases. The stretching piano sound is repeated with slight variations over the first four phrases, therefore the tension accumulates from the energy persistently restrained in the steady part of the stretching gesture.

The first phrase (0:00 to 0:07) introduces a brief and soft metallic noise with a high frequency whose amplitude has a small peak composed of a slight rise and quick fall. This noise is heard as a delicate movement in the distance. In the second phrase (0:10 to 0:21), the metallic noise appears lower in frequency and higher in amplitude, and is perceived as a closer presence. As its energy rises exponentially, the metallic

noise is interrupted by a strong impulsive piano tone. The impulsive piano tone is extended by merging into its reversed form, whose amplitude increases, accompanied by the noise of a grainy texture. This mixture of piano tone and noise is interrupted by a subdued piano sound with a brief, decreasing iterative gesture. From this progression of timbre and gesture, it should be noted that the change of energy state is accompanied by a change of timbre and gesture: the *restrained* energy in the stretching noise is *released* through the iterative piano sound or *blocked* by the impulse-driven piano sound.

The third and fourth phrases are subtle developments of the material introduced in the second phrase. The third phrase (0:22 to 0:40) utilizes layers of the stretched piano sound whose pitch range gradually expands along with the increasing amplitude. In the fourth phrase (0:45 to 1:05), the pattern of the stretching and iterative sounds continues to be explored with overlapping layers, which creates a mixture of these sounds.

In the last phrase (1:10 to 1:48), the energy that has been accumulated through the previous phrases is finally released through the active, iterative gesture of the piano string sound. The gestural texture of this phrase is illustrated in Figure 4-7A. According to the types of gesture, the sounds can be roughly grouped into static piano sounds in low and high registers, impulsive piano sounds in mid and low registers, and iterative sounds of piano keys, strings, and noise (Figure 4-7A). The iterative gesture is explored through various timbres, including the sounds of scratched and plucked strings, struck keys, noise, etc. The impulsive low piano sound evolves into a noise-like timbre from 1:22 to 1:27, creating a brief shift of timbre as well as gesture. The dotted lines

represent the beginning of each musical segment divided by the shift in timbre of the iterative sounds. The first four shifts between the sets of timbre and gesture take place regularly at every third second, as if representing the momentum of the energy that was just released. From the fifth segment, the shifting pace slows down and the overall loudness decreases as well, creating a similar energy-motion contour to that of the decreasing iterative gesture (Figure 4-7B). In addition, the overall pitch range moves down. The pitch of the iterative string sound falls discretely at each appearance while the pitch of the stretching sound falls and its loudness increases (cross-relationship).

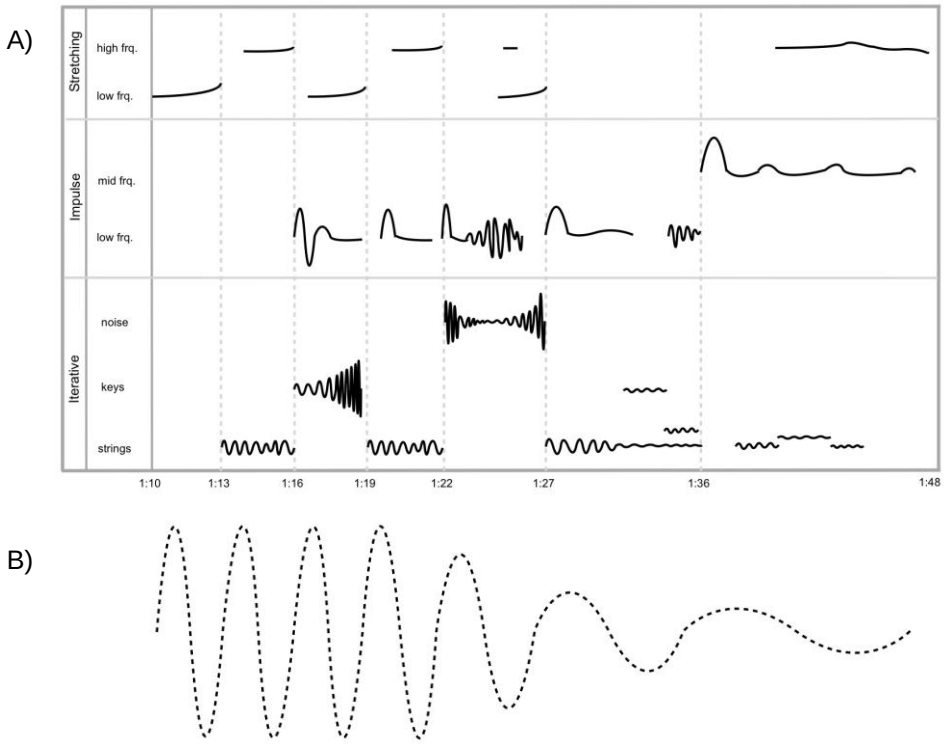


Figure 4-7. A) The layout of the gestures in the last phrase of the introduction, in which the iterative gesture is developed with various timbres and paces. B) The overall energy-motion shape of this phrase is similar to a decreasing iterative gesture.

It should be noted that the overall progression of the introduction is similar to the energy-motion profile of the combination of stretching and iterative gestures, as

represented by dotted lines in Figure 4-8. Applied in a local level as well as a structural level, this energy-motion profile reinforces itself as a significant musical idea in *PianoForte*.

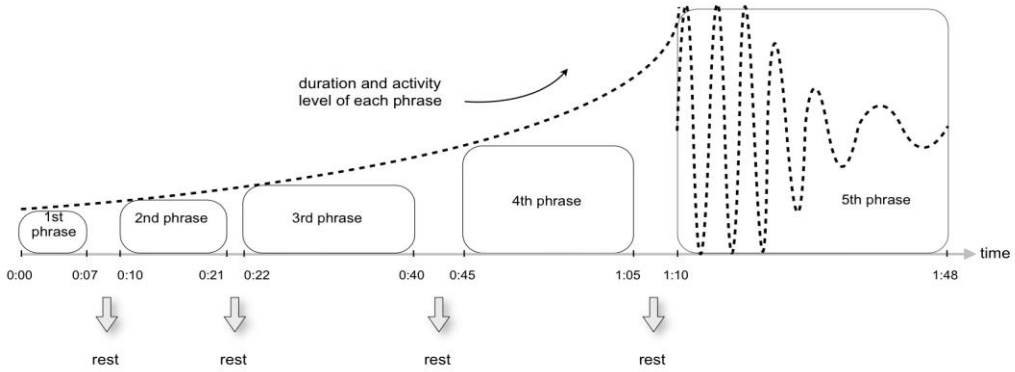


Figure 4-8. The five-phrase structure of the introduction of *PianoForte* on a timeline. The dotted line illustrates the tension accumulated through the stretching gesture and released through the activity of the iterative gesture in the last phrase. The increasing activity and duration of the phrases create an energy shape similar to that of the basic combination of stretching and iterative gestures.

The gradual and careful progression of timbre and gesture in the introduction evokes a metaphoric image of a person who could be deliberately creating this sound with an object. The repeating sequence of rests and progressive phrases can be perceived as the *action-imagination-reaction cycle* discussed in chapter 2. *Action* is perceived as the musical phrase, *imagination* is activated during the rest, in which the quality of the phrase is perceived in comparison with musical imagery in the listener's mind, and *reaction* is perceived as resulting in the next phrase. This perception of the introduction of *PianoForte* as the cognitive process of action-imagination-reaction is supported by the expressive qualities that develop over the course of the phrases, which can conjure up an image of a person attempting to create a desired expression in each phrase. The tension emerging from the contrasting gestures also gives rise to an impression of the imaginary performer's effort, nervousness, and fear of failure.

Therefore, it can be argued that the metaphoric image of a stretched string used to illustrate the tension, is also useful for representing the performative agent's psychological state. In addition, the layout of phrases with inserted rests gives rise to a sense of breathing, which directly signifies a human body. According to Elaine King (2006), a performer's breathing patterns correlate with the performer's gestures and the articulation of musical features (i.e., timing and structure). Therefore, this breathing-like pattern of the introduction is perceived as reflecting a performative agent's musical intention and interpretation. As a listener imagines a performative agent's physical and psychological states involved in creating the expressive quality of the musical sounds, the listener naturally perceives the performative agent as the protagonist in the musical drama.

Bridge (1:48 to 2:19)

The Bridge (1:48 to 2:19) leading to the development is composed of the residual noise and string sound placed sparsely. This part is reminiscent of the introduction since the delicate sounding events are arranged in a breathing-like pattern similar to that heard in the introduction. Each event is preceded by a brief pause and the duration of each event subsequently increases, as illustrated in Figure 4-9. In this quiet section, the string sound with subtle movement tends to linger and move up in pitch, as a preparation for the development in which the stretching and iterative gestures are merged into a bigger movement, along with the increasing timbral and textural complexity.

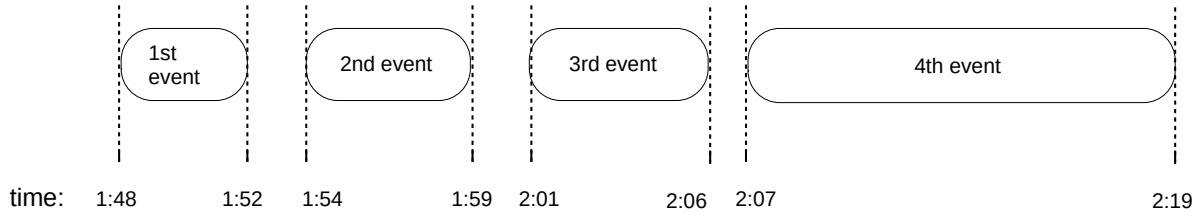


Figure 4-9. The breathing-like pattern of the bridge is reminiscent of the Introduction

Development (2:19 to 4:27)

In this section, musical development is perceived in three aspects: 1) the extension of timbre and texture derived from the string sound, 2) the extensive use of iterative gesture, and 3) the momentary metamorphoses. The development starts off with a variety of timbres created from the string sound by pitch shifting, filtering, and other processing methods. These newly created sounds are layered with the original string sound, building up a dense texture. The composer also uses layers as a way of increasing the dynamic level, which results in the simultaneous increase of timbral density, dynamic, and texture. In spite of the timbral variations, the iterative gesture and fast-moving grain texture of the original sound remain the same in the modified sounds. While the introduction of the piece focuses on the contrast between the stretching and iterative gestures, this part progresses relentlessly through the iterative gestures in a quick and energetic manner. While the stretching gestures are occasionally perceived as supporting the overall dynamic increase (e.g., high pitched metallic sound) or keeping a sense of continuity (e.g., the low muffled piano sound), the predominant presence of iterative gestures gives rise to a keen sense of forward movement with a fast pace.

The iterative string sound, which represented the release of energy and tension at the end of introduction of the piece, is developed further, extending the initial boundaries of timbral possibility. The first momentary metamorphosis into a chorus-like timbre takes place at 2:50, which quickly returns to the iterative string sound. The second metamorphosis occurs at 3:02 into a water-like sound in a swirling gesture between the left and right channels. The water-like sound is present from 3:02 to 3:14 and gradually disappears into silence from 3:14 to 3:25. After a five-second break, the soundworld returns to the distinctive piano timbre along with the iterative gesture that emerged, creating a big contrast with the water-like timbre from the break. The perception of this unexpected timbral transformation is open to the individual's interpretation. It may be perceived as resulting from the exhaustion of musical energy and activity. In the same context, the distinctive piano timbre after a break may be perceived as a return to the beginning. However, the sudden transformation to non-piano timbre may also be perceived ironically in the sense that the initial identity of timbre and gesture vanishes, from which a metaphoric protagonist of this musical drama was envisioned. The following pause augments the sense of wonder and uneasiness even more.

After the piano timbre resumes, the interplay between the iterative grain sound and the impulsive piano sound continues with increasing tension. The combination of the iterative gesture and the impulsive gesture (see Figure 4-5E) is employed the most, in which the energy accumulated in the iterative sound is stopped, rather than released. Halting the energy, instead of unleashing it, results in slightly decreased energy and momentum, as seen in the gradually reducing speed of the iterative pulses. The sound

of the struck piano body is extended in length from 4:02 to 4:10 and can be perceived as involving a performative agent, struggling to continue the movement but failing.

Turn (4:27 to 6:33)

With a low continuous sound that emerges from the end of the development, the Turn section has a sense of continuity rather than a dynamic interplay between gestures. The chorus-like sound that appears again from 4:49 to 5:25 serves to interweave the multiple sounds of both static and iterative gestures. The creaking sound from 5:10 to 5:25, which is similar to, but more extensive than, the percussive piano body sound at 4:02 in the development, conjures up a metaphoric image of a string that is stretched out to a great degree and about to snap. Accompanied by, or propelled by, the chorus-like sound and creaking sound, the music reaches a fluctuating drone at 5:25 that is derived from the string sound, that holds all the sounds together, creating a sound-mass. With the fluctuating drone from 5:25, the piece turns to a new state in which the sound-mass of a dense texture develops into one big stretching gesture. From the low impulsive sound at 6:07, a timbral transformation occurs into the processed voice and whistle sounds. Tension also accumulates during this dense texture and static presence of the sound-mass through the opposing motion of the pitch contours of the low drone and the high individual stretching sound. The individual stretching sounds have the feature of cross-relationship in which the pitch decreases while the dynamic increases, creating an effect similar to Doppler. In terms of form, this section is where musical idea and its development turn to a new state. Based on the above description, it can be argued that the performative agent is turning to a hyper-human level and this is represented by the significant timbral transformation breaking

through the soundworld of the piano by overcoming the physical boundary of a human body.

Conclusion (6:33 to 8:32)

In the Conclusion, a calm sensation is created with the reverberating chorus-like drone as well as the whistling sound, while the previously explored musical material is sparsely revisited. Occasional creaking sounds and water-like sounds are perceived as reflecting the uneasiness of performance. This coexistence of these timbres and piano timbre gives rise to a sense of a pseudo or virtual return to the initial soundworld. After all the sounds fade away, the piece ends with a brief statement of noise and the sound of the struck piano body, which reminds listeners of the beginning of the piece.

Discussion

In *PianoForte,* the characteristic gestures and their resulting energy profiles are used for shaping the individual sounds and for governing the structure of the piece. The stretching gesture with the drastic rise is used for the form of the Introduction. The combined shape of the Bridge and Development is also similar to the abovementioned shape of the Introduction. The only difference is that the shape of the combined Bridge and Development has more of a sudden change between soft, slow sounding events and loud, fast events as illustrated in Figure 4-10.

Figure 4-10. The overall dynamic shapes of the introduction and the bridge and development combined

In the Introduction, an examination of the detail of acoustic features (i.e., amplitude contour) helps understand the sounds in terms of its correlated physical object, its perceived movement, and the performative agent. Perceiving the energy profile of a sound and the causal action behind the sound naturally leads to the recognition of agency. The breathing-like patterns in the introduction as well as in the bridge are heard as a strong indication of performative agency. The rests in the pattern naturally lead the listener to contemplate and expect the next sounding event, as well as to perceive the imaginary agent also *listening* to grasp how to play the next sound. Continuous variations, with subtle differences from the initial timbre and gesture, are perceived as sounds that result from the performative agent's cognition and reaction based on his or her musical intention. In this sense, it can be argued that the performative agent is perceived in the listener's mind as the protagonist in the musical drama. In the rest of the piece, it is plausible that the performative agent can seem to disappear from the musical narrative (Development) or transform into a hyper-human agent (Turn).

It is difficult to interpret every sound in terms of performative agency, especially the complex sounds that are perceived as a sound-mass with a dense texture and are therefore beyond the physical capabilities of a human performer. *Apashia* by Mark Applebaum is an exemplary piece that shows the transformation from gestures and non-gestures. In this piece, a performer is given the detailed instructions of various metaphoric hand gestures to be performed in synchronization with the audio narrative. The performer's mimetic gestures of the musical sounds derived from the voice continue until the sounds develop into complex sounds with a dense texture. The

moment in which the performer stops performing gestures and the sounds evolve to a massive entity portrays a clear boundary between gesture and “beyond-gesture.”

The performative agent implied in acousmatic music, however, is not limited to the human body’s natural and physical capabilities. The complex sounds of acousmatic music are still deeply connected with the physical properties of the sound’s origin. The primary sound materials, significantly transformed in the Development and Turn, can still be perceived as related to the original materials, they just cannot be described in terms of a single human body. At this point, the performative agent is not a single protagonist in the drama; rather it can be argued that the performative agent is motionless, observing the sounding results of his or her intention. This shows not only that acousmatic music can create a vivid sense of performative agency, but also that performative agency can be explored beyond the boundary of a human body, therefore giving rise to hyper-human agency.

Performative agency can also be seen in other acousmatic pieces such as *Klang* by Jonty Harrison, *Wind Chimes* by Denis Smalley, *Tranquility* by Kyong Mee Choi, etc. The common features in these pieces are the use of distinctive gestural characters and their evolving variations through timbral exploration through which a listener can perceive the agent.

CHAPTER 5
CONCLUSION

The starting point of this study was the listening experience of acousmatic music, in which an imaginary person who could be creating all the musical sounds can be envisioned in the listener's mind. This is perhaps striking and ironic in the sense that acousmatic music may seem to have a lack of musical communication or interaction with the audience because of its performance setting, in which the audience is sitting in a dark concert hall or listening room and hearing the sounds mediated by loudspeakers. The perception of performative agency may be understood as the listener intentionally attempts to make sense of the unfamiliar acousmatic sounds in terms of a familiar reference, that is, a performer and instrument. It is acknowledged that one may create a persona in listening to music, and in composing, as evidenced by musical terms that involve some level of personification. This is because listeners still experience music in most cases through musical performance or its recording. In any case, it is evident that certain qualities in the sounds of acousmatic music can conjure up an image of a human body being in charge of the sounds, therefore giving rise to a sense of performative agency. The focus of this study is to define and illustrate the qualities in sounds that cause the perception of performative agency based on relevant research in music cognition and musical performance.

Chapter 1 reviewed the traditional concept of acousmatic music that is grounded in the scientific, objective view of sound and perception. According to Schaeffer's principle of reduced listening, the listener is encouraged to focus only on the pure acoustic features of acousmatic sound. This approach offers listeners the phenomenological experience of pure listening, therefore engaging with the qualities of

a sound that are not recognized from everyday listening. While this phenomenological approach introduces a new way of perceiving and composing acousmatic music, it is inevitable that a listener's instinctive tendency and ability to identify the connection between a sound and the physical world play a critical role in understanding acousmatic sounds. This proves the fact that a sound's acoustic features are inseparable from the physical properties involved in the creation of the sound. For instance, the objects (hands) and causal action (clapping) as well as the acoustics of the space (church) in which the sound is created are reflected in the sound as part of its acoustic features, i.e., timbre, impulsive excitation, and reverberation. Therefore, listeners can perceive the sound's pure acoustic qualities and its relevant physical references at the same time, even when listening to a sound that is abstracted from its origin. The causal and expressive aspects of acousmatic sounds are the key to defining the perception of performative agency. The causal aspect of a sound is explained by the theory of embodied music cognition while the expressive aspect of performative agency is illustrated by musical performance and the gestures of a human performer.

Chapter 2 introduced the theory of embodied cognition that focuses on the tight link between action and perception and how it affects acousmatic music listening. It was explained that one's ability to recognize the causal action behind a sound is generated by one's physical experience with objects and action, which engages the network of multimodal sensations. Therefore, one can visualize the causal action by hearing a sound and re-experiencing or imagining other perceptions linked to the action, such as perceptions of force and movement in a spatial trajectory, touch, proprioception, etc. In embodied music cognition, one's experience and knowledge of living in the physical

world is employed as the metaphor for understanding musical gesture and its meaning. Based on this embodied cognition, musical sounds can be comprehended as representing the physical properties between action and object. Recognizing an action that causes an object to move in a certain way as represented in sounds, the listener can conjure up an image of the metaphoric agent who perform the action, whether intentionally or involuntarily. This embodied paradigm, incorporating one's physical experience into the way of understanding musical meaning, influences the manner of listening to acousmatic music. Schaeffer's reduced listening was already challenged by the ideas of gestural-sonorous objects, ecological listening, etc. Smalley, with his concept of indicative fields and gestural surrogacy, proposed that acousmatic music can be understood by integrating both one's sounding and non-sounding experience, therefore extending the genre of acousmatic music as an art form in which musical and extra-musical contexts can coexist.

Although the concept of embodied cognition explains one's perception of causal action, the causal actions do not necessarily represent the emotional and expressive quality of performative agency. The gestural qualities in sounds that give rise to the sense of performative agency were explicated by examining the gestures of the human performer in Chapter 3. Beginning with defining the term *gesture,* the difference between simple actions and meaningful gestures was demonstrated, therefore leading to the idea of *performative gestures.* The cognitive feedback between perception and action involved in musical performance is considered the most intensive and expressive of musical activities. It was argued that a performer's gestures are the method for creating the desired quality of the resulting sound, and therefore, reflect musical idea

and meaning. It was also argued that the variational progression and irregularity of gestures and resulting expression in musical performance are derived from the performer's musical intention as well as the physical nature and limitations of human beings.

Understanding the physical properties and performative qualities that can be perceived in acousmatic sounds, Chapter 4 illustrated a musical example, *PianoForte* by Yu-Chung Tseng. The energy-motion profile of individual sounds and/or combined sounds was interpreted in terms of actions and objects in the physical world, therefore leading to a metaphoric image of an agent who is creating the action. The numerous variations and developments of the musical material carried through the characteristic gestures and timbres were illustrated as supporting the intentional and expressive aspects of performative agency. In addition, the strong musical drama and breathing-like pattern of musical events enhanced the sense of a human body, as a performer who attempts to realize an ideal performance. It was argued that the performative agent being in charge of the musical sounds is perceived as a protagonist in the musical drama. The musical tension created through the energy-motion contours of sounds was attributed to the emotional intention of the agent as well. Further, the performative agent is not limited to human capacities but can be extended beyond what the human body can do, therefore creating the sense of a hyper-human, which is only possible in acousmatic music.

This study has discussed the performative agency in acousmatic music focusing on human qualities, based on one's perception that is constructed through the experience of musical performance. This document can serve as a starting point for

researching and composing various types of performative agency in other genres of electroacoustic music for fixed media (i.e., soundscapes, sound installations, algorithmic compositions, etc.). In soundscape works, the composer's interpretive participation is represented in the manner of recording and arranging the sounds. For instance, the composer listening to sounds and moving through locations are traced in the work. A listener can perceive the composer's intentions regarding sonic representation according to the layout and adjustment of the recorded sounds. Examples include juxtaposition of multiple sounds, progression of similar sounds from one location to another, modifying sounds with the use of filter or other techniques to emphasize or blend multiple sounds, etc. This way, the composer performs as an interpreter of natural sounds. Through extending this subtle interpretive aspect of the composer in soundscape works to a performative aspect engaged in a musical drama, a hybrid type of performative agency can be perceived. The shift between interpretive agency and performative agency may develop a cross-style between soundscapes and acousmatic music.

APPENDIX A
COMPOSITION: DISPLACED

Displaced explores a compositional style that extends across soundscape composition and acousmatic music. The focus of this composition is the composer's expressive, interpretive intention incorporated into representations of natural environments. This approach results in a fine balance between the two disciplines, one in which the natural soundworld is portrayed in a condensed way, and the other in which performative articulations express creative intentions.

Object A-1. Displaced (.mp3 file 29MB)

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BIOGRAPHICAL SKETCH

Seung-Hye Kim (b. 1978) is a composer and pianist. She received her Bachelor of Music in piano performance from Seoul National University and a Master of Arts in electroacoustic music composition from Korean National University of Arts. She won 1st prize in the Computer Music Competition held by the Korean Electro Acoustic Music Society, and 3rd prize in the Italy Percussion Competition. Her pieces have been performed in many international festivals such as the Florida Electroacoustic Music Festival, Listening In The Sound Kitchen, Seoul International Computer Music Festival, International Computer Music Conference, Society of Electro-Acoustic Music in US, New York City Electroacoustic Music Festival, Electronic Music in Midwest, The 3rd Practice, SIGGRAPH festival, Florida Electro-Acoustic Student Festival, Women's Electro-Acoustic Listening Room, Society of Composers Inc. National Conference and Bourges "Synthese." Her collaborative multimedia work, *Global Drifts*, was constructed as a part of the Accented Body project. The project was supported by the Korean Art and Culture Council, and performed in Korea, England and Australia simultaneously and interactively using live streaming. Her piece Fluctuation for flute and computer has been released on SEAMUS label (vol. 16).