The Influence of Nonverbal Communication Processes in String Quartet Performance

by

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A thesis submitted in conformity with the requirements for the degree of Doctorate of Musical Arts
Graduate Department of Music
University of Toronto

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Abstract

Nonverbal processes play a significant role in the musical communication that takes place between ensemble musicians during performance. This dissertation focuses on players in professional string quartets, whose artistic goal is a collective interpretation of a pre-composed musical score. In this study I focus on nonverbal communication realized through physical gesture, eye contact, breathing, and sound as fundamental aspects involved in string quartet coordination of synchronization and expression. As such, I position various forms of nonverbal communication as foundational to string quartet interaction and also draw from theories of interaction and gesture to enhance and support my investigation. The purpose is to isolate specific qualities and functions of these various nonverbal modes, and analyze how they are influenced by one another and how they work together or independently from one another. Some primary issues that are addressed include: the nature of the information being shared between co-performers; the correlation of nonverbal processes to those of “spontaneous musical variation” during performance; the impact of familiarity between players; examination of the reception of nonverbal communication as a competence; and how leadership is navigated in the context of string quartet performance. In order to help address these issues I draw critically on my own experiences as a string quartet performer, record and analyze videos of professional string quartet
performances, and interview members of the groups. Key findings are the importance of the
different levels of perception within vision and sound, and their interaction with breath and
gesture in helping instigate sound and movement within this context. Understanding the complex
interactions of elements was aided by theorizing the idea of the different functions of modes and
channels of sensory reception utilized in nonverbal communication, and the application of
concepts such as multi-functionality, anticipatory auditory imagery, inter-reaction, and
empathetic creativity as a means of coordinating and inspiring players during performance. This
thesis hopes to increase the chamber musician’s understanding of the multiple ways in which
these processes can be used, and outlines the most useful ways in which these processes can be
applied during the moment of performance.
Acknowledgments

There are many people to whom I am extremely grateful for helping make this project a reality.

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Three concert halls generously granted me permission to video live performances of the string quartets. There were a few unforeseen distractions that were caused because of this and I very much appreciated their dedication in defending and believing in my wish to capture these performances in front of a live audience.

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Chapter 1

Introduction

After many years, I have come to understand my experience of playing in a string quartet as full of particular kinds of beauty and tension. This comes from a realization that each performance places me at the centre of ongoing processes of unspoken interaction and, indeed, communication. These communications include not only the sounds we in the quartet make together, but also many other movements, cues, and signals that help us create the music. When everything works correctly, not only is the music we produce beautiful and at times tense, but so too are the means by which we coordinate our actions in order to create it. A particular kind of tension and release arises from the challenges of creating music in a small, intimate ensemble in which leadership is constantly shifting and dependent on unspoken “conversations” between all members. To set the stage for this dissertation, which analyzes nonverbal communication in string quartet performance, I will give a brief account of one such experience.

We are backstage, waiting in the wings for the signal to go on. That signal will be audience applause when the presenter has finished the introduction. We are all lined up. As the violist and thus the musician who sits on the “outside” of the quartet in our group, I am usually first to go out. I stand in front of our loosely formed single file line. Behind me, my colleagues are engaged in various activities as they wait—straightening their posture, fidgeting, asking last minute questions. “There’s the audience clapping,” I say to myself, and I look back once more to make sure everyone is ready before I step onto the stage. I try to walk with purpose and poise while maintaining a good pace. At the same time I am smiling and welcoming the audience, thanking them (nonverbally) for coming.

After quickly glancing again at my colleagues, we all bow together and sit down in our respective seats. Our cellist pulls her endpin out, and we all make sure our score pages are in the correct order. I wonder how tonight’s performance will unfold. Will we manage to begin precisely together? Will I be able to keep my focus all the way through the performance? Will I manage to play that tricky passage without my fingers fumbling? Will I be able to hear the musical lines and phrases unfolding, or will I remain stuck retroactively in every moment, analyzing every note as it sounds? Will I remember to take the correct repeats and be able to turn my pages quickly enough? Will I be able to catch my colleagues’ intentions a split second
ahead of time so that we might move together seamlessly? Will I be switching in and out of my musical roles with enough flexibility and fluidity in order to balance the four voices just perfectly? Will I turn out towards the audience just the right amount, or will I attract too much attention to myself by overturning? Will I be able to connect with my colleagues to create a magical texture and colour in that special spot? Will I notice the subtle change in articulation that they made differently than when we rehearsed it? These are a small fraction of the questions and concerns that run through my mind at any given time prior to and even during the performance.

Sometimes on stage it feels as though lightning and firecrackers are going off inside my mind and body as I am playing. My focus and attention—aural, visual, and physical—quickly moves around, shifting and being shifted constantly as I try to manage the details of the performance in the past, present, and future simultaneously. Besides wondering if we are doing the composer justice, I question whether we are able to pull the audience along with us. It is a wonderful moment when I can sense, hear, and feel the audience listening to the music we make. But as quickly as it happens it can be gone again, and I am left asking again what musical wonder or disappointment will happen in the next moment?

We finish the piece, and after bowing, our first violinist asks me (nonverbally) with an indication of her head if we should go backstage and tune before the next piece. I nod my head yes—or more accurately, in agreement with what was less a question and more a request. We move off the stage together.

The next day I watch a video of the previous night’s performance, and I am surprised at what I see. I appear fairly static, with mainly just my bow arm and left hand fingers moving. Where are the firecrackers, bolts of lightning, snack-crackle-pops that were going off in my mind? How come I cannot see them now? It all looks so easy. However, that appearance is very far from my internal experience. How can there be such a difference? The desire to answer this question and unravel some of the related beauty, tension, and challenges of playing and performing in a string quartet was my initial inspiration for choosing to analyze an essential but under-studied aspect of string quartet performance—the ongoing, unspoken, and complex communication that is necessary to give the appearance of effortlessness to the audience and that keeps me as a performer feeling so many “firecrackers.”
Before I begin discussing the different kinds of nonverbal communication that are central to string quartet performance, I would like to stress that most of it is sonic. Indeed, few would dispute the notion that music is about the aural experience for audiences and performers who must also be listeners. That being said there are other means of nonverbal communication that play an important role in the transfer of information between musicians during performance and are necessary to realize these sonic goals. Throughout this thesis I am going to consider some of them, theorizing them as modes and channels of sensory reception, analyzing the information they are capable of carrying, and investigating their relationships to musical sound.¹ As a foundation for that analysis, however, it is important to describe some basic characteristics of professional string quartets, as they represent a unique group. This description will help clarify the particularities and establish the basis for the various modes of nonverbal communication that I will discuss in detail throughout the rest of this dissertation.

1 Characteristics of a String Quartet

The string quartet is unique both because of its organizational characteristics and the wealth of music composed for this small ensemble. It involves three different instruments from the string family, the violin, the viola, and the cello, but four players, a first violinist, a second violinist, a violist, and a cellist. Like most Western art music performers, string quartet members traditionally work from a pre-composed score. This score is filled with notation; signs and symbols that communicate and give directions for realizing in sound the musical imaginings of a composer who is typically not performing in the group. For string quartets that work together without a pre-designated leader, successful performances are contingent on a unified interpretation of these directives.² Scholars such as Elaine Goodman and Nicholas Cook liken this to the way that actors work from a script. Like actors, string quartet musicians work from a written page and strive to realize its instructions in performance most often without the author present. But unlike actors who use words to convey meaning (and whose actions are based on

interpretations of those and other words), string quartets, as noted by Murnighan and Conlon (1991), strive to produce meaningful “transcendent, glorious sound” during performance.

In the absence of words, string quartets must make transcendent, glorious sound based on a minimum of textual directives. The complexity of interpreting the symbols that are the basis of performances, then, inspires musicologist Cook to argue for a “reorientation of the relationship between notation and performance.” Cook urges performers to embrace the uncertainty that is the result of symbols and minimal textual directives. This involves interpreting the score according to his notion of script, which may take into account its historical, theoretical, and stylistic context along with the notational markings and structures derived from more conventional analysis. Interpretation of a score according to this conceptualization depends on, among other things, who is playing and where. Yet arriving at a cohesive interpretation, the foundation for successful performance, becomes all the more complicated when it involves four people with no explicitly designated leader. Inevitably decision-making challenges arise when realizing the score related to, for example, what role each member will play at any given moment and how coordination of these roles will be accomplished. All of this must be understood within the context of agreement on the meaning of the music between the members. Various forms of communication are central to meeting such challenges.

As I suggested, leadership in string quartet is a complex and often changing matter, very different from an orchestra with a conductor. Members must negotiate direction through both social and musical processes. For the purposes of this study, I am interested in the negotiations that centre around interpreting the score and musical approaches that facilitate its realization in performance. There are a variety of ways that the issue of leadership might be addressed by string quartets. Two extreme and opposing methods are: 1) In some instances, one person acts as the leader, making key musical decisions and directing the group through both verbal and nonverbal means during rehearsals and performances. This has traditionally been thought of as the responsibility of the first violinist. 2) In other ensembles, the quartet acts as a self-managed

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team, where “team members share or rotate leadership and hold themselves mutually responsible and accountable for a set of performance goals.” However, these are two extreme examples, and there are times when other approaches to leadership are used. For instance two people can co-lead simultaneously, or one player can follow another while the other two players follow the player following (a chain effect); there are even moments where no one acts as a leader. In fact, as noted by Gilboa and Tal-Schmotkin, many of today’s groups utilize alternating, shared, and in some cases, equal, leadership.

Because of the varied and often shifting leadership configurations used by different string quartets, I will use the set of terms “initiator” and “responder/supporter” instead of “leader” and “follower” throughout this thesis when analyzing musicians’ roles in string quartet performance. I do this in order to bridge the psychological gap that sometimes exists between the concepts of leading and following, when the follower’s actions are unassertive or submissive in comparison to the leader (see Brinner 1995). As I will show throughout this paper, that kind of relationship is ineffective in aiding synchronization between string quartet musicians as they are playing. However I will use the terms “leader” and “follower” when I am referring to scholars’ descriptions of leading and following and I will also use the term leadership when addressing the general notion of the relationship between the two roles.

Regardless of how the members of a string quartet organize leadership roles, during performance all four musicians’ actions, including those of the initiator, are greatly regulated by the score. As Elaine Goodman (now King) notes: “The way in which the music is composed can also affect the relationship between performers (thus the composer has a certain impact on the social interaction between musicians).” The authority of the score and different attitudes toward it with respect to interpretation thus informs matters of leadership. Because the relationship between leadership, attitudes toward the authority of the score and fidelity to composer’s intent, and approaches to

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6 Ibid., 33.

musical interpretation are important topics for string quartet performance, these concerns will be explored throughout this investigation.

Personnel stability is another important characteristic of the string quartet: most ensembles usually involve the same four people working together over extended periods of time—changes in membership are relatively infrequent and generally undesirable among more serious ensembles. Paul Robertson, former first violinist of the Medici String Quartet, says, “Few activities require such long-term, intimate collaboration, doing fiendishly difficult work in pursuit of a creative outcome.”

The relationships between string quartet musicians are also typically more intense than those between other kinds of workers. Arnold Steinhardt, the first violinist of the Guarneri String Quartet (a group now retired), observed that his quartet had “shared too much experience to be mere business partners or colleagues” and that they experienced a “true intimacy on stage.” This is also reflected in the saying that the relationships within a string quartet are often compared to a four-way marriage. Players become extremely familiar with many different aspects of their colleagues’ personalities in relation to both musical and social behaviours. Often they develop the ability to predict or at the very least “read” what their colleagues will say and also play with great ease, after many years of interacting together. That is not to say that these predictions are always accurate, however. These relationships, both between individual members and subsequently the whole group, are in a constant state of flux as people change and develop. Thus, there is a dynamic nature to the process of creativity that occurs with most groups.

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bond that draws most string quartets together is the amount of high quality music that has been composed for this ensemble. String quartet members almost always “identify with and are inspired by the music they play.”

In string quartet performance, each of the four people is responsible for a different musical line, part, or role. However, as mentioned previously, there are only three different instruments. Of the two upper lines, usually the first violin plays the higher line and second violin plays the lower line. The violist plays a line lower than the second violin, and the cello often plays the bass line for the group since it is tuned one octave below the viola. However, these lines frequently overlap with each other as composers commonly grant different and interchanging roles to each player throughout any given piece.

Even as roles change, however, the quartet constantly has to navigate sonic balance between the four players to produce an integrated interpretation of the score. There are many challenges to overcome in order to achieve this unity, including recognizing and managing the register in which each instrument plays. The human ear more easily hears the highest and lowest frequencies played at a given time, while the middle range is often the most difficult to process sonically. Quite often (but not always) the first violin plays the highest voice and the cello is playing the bottom line. The second violin and viola often play in the middle range. So the musical line played by the first violinist will often be what the audience can hear most easily.

Quartet researcher David Rounds elaborates on this idea when he refers to the first violin line, saying, “As the highest voice, it is the easiest to hear and the obvious choice for the melody.” However, one of the exciting elements of string quartet playing for performers and audience members is how the melody gets passed around from player to player. For this reason balance of instrumental voices within string quartets is often of great concern among musicians and must change depending on who is playing the principle line. In this sense, members in the group have

14 Rounds, The Four and the One, 7.
control over which voice or parts are primary at any given moment, and the first violin is not always heard most prominently as is often assumed. There are different ways to sonically balance the group, which include members playing more or less forcefully, altering the projection or energy levels of each member, and even using visual signals. The need for constant adjustment of volumes and colours means that when performing, string quartet players are truly inter-related and dependent on each other to execute the music.

There are also technical issues that make it challenging to achieve matching sounds and/or an optimum sonic blend as required in performance. For example, the strings on the different instruments “speak” at different times. String response or onset (called “speaking” by string players) varies with the thickness of the strings (the cellist has the thickest string), and their age. Thicker strings take more energy and therefore more time to start, and older strings often will not speak as quickly. Additionally, response depends on how much rosin is on the bow (more rosin will give more friction and so the string will respond more quickly), and also the condition of the hair on the bow. These variables will affect the preparation time needed for movement to produce sound on the instrument at the correct time. In practice, the understanding of the requirements and utilization of these subtle movements will need to be integrated into a range of more expressive motions. In general, cellists and violists will need their movements to be a bit ahead of the violins or the violins will need to wait a split second before they play in order for all instruments to sound exactly together. If a musician monitors how well the bow hair is responding to the string and vice versa this will affect preparation time and therefore the movement to coordinate sounds. In addition to these technical issues, there is also the matter of the instruments and bows themselves. Musicians in string quartets will often search for instruments and bows that match in sound quality and timbre. Once that is found, the upkeep and adjustment of the instruments will affect how they sound. This can influence the way that the player moves, in order to make the instrument sound the way that they want.

String quartet members constantly use a variety of ways to match each other’s sound depending on the style of repertoire. Having some basic knowledge of how each instrument functions technically is necessary to achieve sonic cohesion, as it provides the members with the ability to receive information about their colleague’s actions visually and aurally.
In order to achieve an elite level of performance, string quartet players must devote considerable time not only to performing, but also rehearsing with their group. Casual gigging, “sitting in,” or even performing with substitute musicians who are not very well rehearsed is rather uncommon among the most respected ensembles. Based on my experience as a string quartet performer and many conversations and interviews with other musicians, during rehearsal musicians typically start and stop as they work through the piece, refining, negotiating, and working things out together. The players use words to try to clarify the ideas and concepts that they intend to convey through the music to come to a unified interpretation of the piece.

During performance, however, communication processes change, words are not permitted and the unified interpretation of the work must be presented in a continuous manner, making processes of nonverbal communication crucial. As noted by scholar and performer J. Murphy McCaleb and based on performers’ testimonials, throughout the experience of performance, musicians strive to reach a state in which the music ‘plays itself,’ a description that McCaleb notes is “reminiscent of Csikszentmihalyi’s concept of flow (1990).” In this enjoyable state neither anxiety nor boredom are experienced, as challenges increase and greater demands are placed on the skills of the individual, leading to “previously undreamed-of states of consciousness.” In this heightened flow state, senses used to perceive nonverbal information and the cognitive skills used to process the information will induce an increase in the amount and flow of information. Also aiding this increase of attention to nonverbal processes is the effect of the presence of an audience. Awareness that the audience is actively listening greatly affects the focus and energy of the performers. This psychological state may affect, either positively or negatively, how players execute musical ideas and concepts that were discussed in rehearsal, making it all the more important for other members to be able to react and respond accordingly in order to integrate these changes immediately into the performance.

Ultimately the most important part of what a string quartet does during performance is expressed through the collective sound of the ensemble. A quartet’s sound during performance is critical in


terms of career success.\textsuperscript{17} This raises the stakes for the interactions between members that take place either sonically through the music or by other nonverbal means when on stage performing in public. The process of starting and stopping, methodical problem solving, and the spoken communication that is so central to rehearsal has no place in front of an audience.

Crucially, the nonverbal communication needed on stage takes time to develop and differs between various string quartets. While it can seem second nature to ensemble members and is often taken for granted, a change in the group can highlight the complexity and importance of being able to communicate without speaking. Julie Rosenfeld, who played for twelve years in the Colorado String Quartet states this plainly: “So much of our communication was nonverbal. It’s very interesting now, having a new person come in, to have to say things that had been unsaid for a long time in the group.”\textsuperscript{18} Nonverbal processes clearly need time to develop and are a vital, albeit often seemingly automatic skill (with no need to consciously or explicitly think about doing them) among successful string quartet groups that have been working together for long periods of time.

\section{Research Goals}

The general characteristics and particular challenges of string quartet performance point to the importance of various forms of nonverbal communication. For this reason, my overarching aim for this dissertation is to examine both “explicit” and “implicit” aspects of nonverbal communication. By explicit aspects of nonverbal communication I mean those actions that are intentionally communicated by the sender and usually clearly understood by others, especially but not always if the musicians have some degree of familiarity with one another. By implicit aspects of nonverbal communication I mean those actions which may or may not be intentional and whose meaning can be interpreted in different ways. Particular attention will be paid to how various distinct processes of nonverbal communication might influence string quartet members in their socially informed interpretation of a musical score, and their coordinated rendering of the musical notation. In other words, I will analyze string quartet musicians’ unspoken musical communication.

\textsuperscript{17} Howard Todd Robinson, “Metaphors of the String Quartet: Constructs for Small Group Development,” (PhD dissertation, City University of New York, 1997), 61.

interaction during performance. To do this, I will first define more clearly what I call “modes and channels of sensory reception” of nonverbal communication and further discuss their importance during performance. I will then explore how various modes and channels of sensory reception of nonverbal communication may work independently or together, in complementary or at times contradictory ways. A subsidiary part of this discussion is an investigation of how musicians manage both incoming and outgoing information. With these two primary goals in mind, I will also pay close attention to how much of the string quartet music making activity is pre-planned and how much emerges in performance, especially in relation to coordinating the musical choices in a rendering of the musical score. This aspect of my research promises to contribute to studies of spontaneity and improvisation in music practices such as Western art music, that are rooted in literacy and pre-composition (see Benson 2003). In particular for string quartet performance, addressing the importance of flow and the production of “transcendent glorious sound” will inform how performers achieve their performance goals, while managing mental stimulation that results from using the different modes and senses available for transferring and receiving nonverbal information.

2.1 Nonverbal Modes and Channels of Sensory Reception

This study focuses on professional string quartets, concentrating on four key aspects of their nonverbal communication. These aspects or “modes and channels of sensory reception” of nonverbal communication are based on categories proposed by music theorist Evan Jones (2009), who writes, “By definition, the genre of chamber music denotes a certain intimacy—the aural, visual, gestural, and subliminal communication among performers.”¹⁹ These forms of communication can be divided into two categories: modes, the giving of information, and channels of sensory reception, involving the reception of that material. In general, modes generate or transmit information (either explicitly or implicitly) through sound, the eyes, gesture, and breath, while the perception of various modes happens through senses: vision, hearing, and feeling.²⁰ Within each of the channels of sensory reception used to perceive information there are

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²⁰ Author’s modes and channels of sensory reception based on the categories proposed by Jones (2009).
“sub-channels” that allow a range of information to be accessed at differing levels of focus, for example, focal and/or peripheral vision, and attentive listening and/or background listening. Additionally a performer may be manipulating the information they receive by transferring it to the foreground or background through the different sub-channels. At any point in the performance there may be multiple modes at work within the channels of sensory reception. For example a player may hear both musical and breath sounds at once. There may also be crossover of the channels of sensory reception that would work at receiving information via the same mode. For example a player could see, hear, and feel how and when another player is changing his or her bow, which involves three possible channels of sensory reception receiving the information from one mode. Importantly, the modes and channels of sensory reception of communication are operating simultaneously when they occur, sending and receiving multiple kinds of information as performers make music together.

For this project, I have focused on the sense of vision in chapter 4, while the modes of breath and gesture are studied in chapters 5 and 6 respectively. Sound and hearing, on the other hand, are addressed throughout the dissertation. This is because sound and hearing are the primary media through which musicians communicate as they play. Additionally, I have specified that what I call gestures or body movements of musicians be limited to those involving the parts of the musicians’ bodies below their necks. While I consider many facial and eye expressions gestures, they will be addressed specifically in chapter 4: Face, Eyes, and Visual Signals. I will additionally address the visual perception of body movements made below the neck in chapter 6: Towards an Understanding of Performance Gesture.

These modes and channels of sensory reception, I suggest, help better characterize the different types of nonverbal communication that are posited as central to string quartet performance by professional string quartet cellist Stephan Goerner. He, along with business management researchers George Tovstiga and Stefan Odenthal, notes that,

[nonverbal communication] occurs through collective, inner-sensing within the quartet, and through musical-acoustical or visible cues. Communication may also
occur through gesturing or mimicry … Breathing is an extremely important form of communication and integration, as is the very entity of silence.21

As I will discuss, visual and sonic cues can be sent and received in various ways involving breathing, the use of a range of body parts, and different uses of seeing and listening. My initial research and experiences as a performer and audience member suggest that certain types of nonverbal communication are more effective and more important in different situations, at times serving different specific aims and demanding different kinds of knowledge. For example, gestures and movements (which are linked also to the channel of visual reception) play a role in inter-performer communication, communication with the audience, and also the actual act of playing the instrument. Expressive eye communication through direct eye contact can be quite effective for conveying emotion and other kinds of information to co-performers. However, in my experience, string quartet members use direct eye contact only at very specific times. This is because direct eye contact can be so focused, and players must be attentive to many different types of nonverbal communication simultaneously without getting overly focused on one. Peripheral vision or looking at different parts of co-performers bodies, on the other hand, often serves well to coordinate action or receive information with more subtlety—thus it is often not apparent to audience members but is crucial to performers. Similarly, breathing is critically important for cueing the beginning of a piece and instigating multiple adjustments throughout the performance; it is also linked to sound production and phrasing. Note again that this type of communication is also partially visual. Finally, listening is an integral part of receiving many kinds of musical information that are vital to realizing the direction of the music. As I suggested above, modes are predominantly aimed at expressing or carrying information, while the senses provide receptacles for receiving and interpreting this information. There is considerable overlap and crossover between the modes and channels of sensory reception, and when combined, such nonverbal communication becomes foundational to processes of interaction, both within the group and to some extent with the audience.

3 Conclusion

The common goal among string quartet performers of blending the sounds of four distinct instruments into a single, unified voice creates a number of unique challenges. A close relationship between initiators and responders within the ensemble is critical in making it possible for the musicians to move through the piece together and create this musical unity. These relationships are predicated on nonverbal exchanges of information, which take place through multiple modes and channels of sensory reception that perform different functions including both sending and receiving information. These modes and channels of sensory reception include sound and hearing, eye expression and vision, gesture and body movement, and breathing.

By investigating nonverbal processes in performance, this study promises to add to the growing body of research on the acts of making music (e.g., McCaleb 2014, Bayley 2012, Seddon and Biasutti 2009A, Sutton 2004, Brinner 1995). Specifically, it aims to explore the role of the body in nonverbal communication between performers. Finally, the implications of my study will support ongoing efforts to challenge the boundaries between spontaneous or improvised performance and the performance of pre-composed music. This distinction, despite years of challenge from researchers (e.g., Nettl 1998 and Benson 2003), still has tremendous traction among many performers and audiences involved in string quartet music. The literature reviewed below will help us come closer to a more thorough understanding of the processes that groups use to musically navigate the score while performing.
Chapter 2

Literature Review

1 Communication and Interaction Research

Communication and interaction within groups has been the focus of study for many scholars working in both the social sciences and humanities. These researchers come from various fields including sociology, social and occupational psychology, organizational behaviour, small group research, philosophy, linguistics, and the arts. Similarly, numerous scholars have studied communication in relation to music, and there are entire books devoted to this subject including *Music and Communication* (1970), *Musical Communication* (2005), and *Music Grooves* (2005). These books cover a broad range of topics related to both verbal and nonverbal communication between different participants in musical events (e.g., from singers to instrumentalists and soloists to very small chamber ensembles) and in various cultural contexts (e.g., Indian raga music, Western rock bands, Japanese music, and jazz musicians).

Musical interaction, in contrast, is less frequently the focus of monographs by music researchers. Perhaps musicologists’ extensive use of scores and interest in musical works—which makes engaging with music-making as embodied practice more difficult—helps explain this to some degree. Ethnomusicologists and jazz scholars seem to hold a more vested interest in the study of interaction in performance, as suggested by several attempts to better understand improvised music or music of aural traditions. Examples of this include Brinner’s *Knowing Music, Making Music: Javanese Gamelan and the Theory of Musical Competence and Interaction* (1995) and Ingrid Monson’s *Saying Something: Jazz Improvisation and Interaction* (1996). More recently performance studies scholar J. Murphy McCaleb, a performer himself, published *Embodied Knowledge in Ensemble Performance* (2014), a book based on his dissertation, in which he tackles the issue of ensemble interaction during performance from the perspective of physical (procedural) knowledge inferred between co-performers that is developed over years of experience from playing their instrument.

Taking a cue from scholars such as McCaleb, Monson, and Brinner, and a growing number of other researchers who focus their inquiries on processes of music making, rather than “music” in a broad sense, my dissertation is intended to speak to the now rapidly growing body of research.
on communication and interaction, both verbal and nonverbal, in musical performance. While more attention has been given in the past to verbal communication (e.g., Bayley 2011, Feld 2005, Seeger 1977), various forms of nonverbal communication related to, for example, movement and gesture, is now attracting increasing interest from scholars (e.g., Gritten and King 2011, Godøy and Lehman 2010, Gritten and King 2006, Davidson 2005, Clayton 2005, Hatten 2004) working with a range of ensemble types. However, there has been relatively little in-depth qualitative analysis of nonverbal communication in the context of professional string quartets. Usually, most research on nonverbal communication examines other types of performers or chamber groups, such as student string quartets (e.g., King 2006 and Davidson and Good 2002). While certainly useful, the more common approach of studying student groups leaves unaddressed what is happening in elite levels of string quartet performance, arguably the most visible and influential performers of this music. There has also been a significant amount of research done on communication processes in piano duos, for example by Keller and Appel (2010), Goebel and Palmer (2009), and Williamson and Davidson (2002). Again, while certainly useful, playing piano not only involves body movements—a significant part of nonverbal communication—markedly different from those central to string playing, but more importantly, processes of communication between two people are quite different from those among four people.

Notably any analysis of nonverbal communication processes in the context of string quartet performance must take into account the fact that communication is mediated through, or serves the realization of a written score—an issue that is often minimized in many studies and that is not present in the context of oral traditions. While Seddon and Biasutti (2009A) acknowledge this crucial point, the direct relationship between nonverbal communication and the written score is not examined in their work. Despite the difficulty posed by taking into account the impact of the written score on nonverbal communication, some scholarship on string quartets has begun to address the additional layer of complexity notation poses in their music making processes. For example, McCaleb (2014) takes the score into account and analyzes the interaction processes that happen during a string quartet rehearsal. Other examples include studies by Lockwood (2005), Blum (1986), and Fink (1985), which feature string quartet members discussing group

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22 With the exception of McCaleb (2014), Glowinski et al. (2013) who address nonverbal interaction through head movements, and Seddon and Biasutti (2009A) who address modes of verbal and nonverbal communication.
interpretations of specific pieces. While these studies provide a general overview of group creative decision-making processes, they are based on discussions and interviews with string quartet members and not direct observation of performance. Furthermore, the authors do not theorize group interaction during the making of musical sounds.

1.1 Differences Between Communication and Interaction

In the sections above, I treated two related but distinct processes—communication and interaction—uncritically, in effect conflating them. Yet the relationship and differences between the two are important to the organization of this study and, therefore, merit further consideration. I understand communication—my primary concern—as foundational to interaction. Thus, while communication studies are vital to my project, extant theories and models of interaction help infuse them with a more performance-centred perspective. Indeed, as I mentioned above, most studies of musical communication emphasize scores rather than the acts that realize them in sound. Of particular interest for shifting away from this common tendency are the works of Brinner (1995) and McCaleb (2014). Interestingly, both of these scholars acknowledge and define the difference between the terms communication and interaction, in their investigations and theories centred on musical performance.

Brinner identifies four major overlapping domains of interaction; network, system, sound structures, and motivation. He proposes that communication between group members falls under an “interactional system.” Thus Brinner not only recognizes a difference between communication and interaction, but he also suggests that communication is a subset of interaction. However, it is important to note that his interest is not with nonverbal communication specifically. Rather, he is interested in the various aspects of interaction more broadly. Moreover, while Brinner does endeavor to develop a theory of interaction that is flexible enough for application to a variety of musical practices, his musical focus remains on Javanese gamelan. Nevertheless, Brinner’s discussion on cueing systems within the interactive system will be used to help define cues used within string quartet performance, and his


24 Ibid., 169.
deliberation of the complex relationship between leaders and followers that takes place in music making will be used to elucidate the processes and possibilities of these relationships.

McCaleb, on the other hand, breaks down the current models of communication that are used in the study of music performance. More importantly, he ultimately deems these models highly problematic when used by music scholars because they are rooted in an understanding of social interaction and not music performance. Following from this intervention, he argues that music performance research should be based on what he theorizes as a “new paradigm of musical interaction.” Subsequently he proposes his own framework of interaction that he names “inter-reaction” based on the stages of transmitting, inferring, and attuning. These stages involve musical information being conveyed to each member multi-modally, musicians interpreting their colleagues’ musical intentions from this information, and finally the constant shift and modification of their own performance to synchronize with the performance of the group. I will elaborate on McCaleb’s observations and theory that much of the nonverbal activity that happens in music performance is based in reaction. Also I will refer to his points about the complexity of playing instruments and the ability of performers to infer information from one another due to their extensive training and knowledge on the particular properties of instruments (in this case, string instruments). Also useful to my study is research that focuses specially on string quartet processes. This literature will be reviewed in the following section.

1.2 String Quartet Specific Research

Research on string quartets has increased in recent years with attention to questions of interaction and nonverbal communication becoming central to this work. Topics addressed include: “inter-reaction” in graduate-level string quartet performance (McCaleb 2014); control of relative timing in string quartet performance (Wing et al. 2014); how head movement and direction affect expressivity and cohesion in string quartet performance (Glowinski et al. 2013); quantitative

26 Ibid., 81.
27 Ibid., 100.
28 Ibid., 107.
analysis of affective behaviour and the emergence of leadership (Varni et al. 2013); rehearsal interaction, primarily verbal, between a professional string quartet and a composer (Bayley 2012); verbal and nonverbal communication in rehearsal and performance within a professional string quartet (Seddon and Biasutti, 2009 and 2009A); roles within student groups (King 2006); learning and sense making in a professional string quartet (Tovstiga et al. 2005); social issues in rehearsal and performance in a student string quartet (Davidson and Good 2002); group paradoxes and success of professional string quartets in Britain (Murnighan and Conlon 1991); and leadership and conflict (Young and Colman 1979). Much of this research shows that musicians in string quartets use nonverbal communication as a basis of connection during performance to achieve combined coordination in the realization of the pre-composed score. To quote musicologist Jane Davidson (2005), “… performers make a series of gestures which serve to clarify and coordinate certain ideas for communication to co-performers and the audience, and which are embedded within a cultural framework.”

Whereas gestures can be a means of communication between members of a string quartet and also with their audience, they are not the same. For instance, while some gestures facilitate communication both between musicians and between musicians and their audience, there are many others that are used primarily between ensemble members, with no intentional audience involvement, as well as those that are typically intended primarily for the audience. For example, members of the group will turn their bodies towards the audience in order to project their sound in that direction. Depending on the circumstance, this is an important distinction for chamber musicians and for analysts. My treatment of gesture and nonverbal communication more broadly will emphasize that which takes place between musicians in the ensemble.

One of the key studies informing this dissertation is that by Seddon and Biasutti (2009A) on verbal and nonverbal communication in string quartet practice and performance. For this study, the authors work with a professional Italian ensemble, the Paul Klee Quartet. Seddon and Biasutti’s research is based heavily on the concept of “spontaneous musical variation,” which they define as classical performers’ ability to “employ a wide variety of musical interpretations” that can “emerge from the interplay of stocks of musical knowledge when musicians are

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empathetically attuned.” Seddon and Biasutti identify six modes of communication: each one is classified as either a verbal or nonverbal aspect of one of three categories: instruction, cooperation, and collaboration. They also identify two levels of attunement between musicians, in describing how they are engaging or interacting with one another. The first level, called “sympathetic attunement,” means that musicians are engaged with each other in predictable ways. This is a basis of musical cohesion without any sort of risk to the agreed upon interpretation, and in the authors’ study was associated with moments in which the researchers observed facial and body expressions among the musicians that suggested relative disinterest. “Empathetic attunement,” on the other hand, refers to those times when musicians are engaged with each other in creative and challenging ways during performance. Seddon and Biasutti associated this level of attunement with moments of risk-taking, evidenced by smiles, collective affirmative nodding, and animated body movements among the performers.

This association is the basis of one of Seddon and Biasutti’s most important contributions to the study of string quartets and ensembles more generally, the concept of “empathetic creativity.” Empathetic creativity, for these scholars, is the highest form of music making and refers to a state in which all of the ensemble members are engaged in creating “spontaneous musical variations” that allow them to challenge and respond to each other from moment-to-moment. This state, Seddon and Biasutti argue, is much more likely to occur during performance rather than in rehearsal and refers to those moments when “the music itself acts to communicate along with body language, which tends to be more exaggerated expressing enjoyment and positive evaluation of their combined playing.” The ability for performers and researchers to better understand empathetic attunement, and when and how such an experience might occur, is

31 Ibid., 127.
32 Ibid., 128.
33 Ibid., 128-29.
34 Ibid., 133.
35 Ibid., 128.
important to any study of music performance in ensembles. This level of attunement between players suggests a performance characterized by dynamic interplay among musicians, which enhances the musical experience for both performers and audience members. Yet these exchanges remain difficult to understand in ways that do not risk mystification, and require new methods of study. I suggest that close examination of body language, facial expression, eye contact, musical cues, and gesticulations can help to better study these moments of dynamic interplay, and also help musicians achieve this important aspect of string quartet performance.

An essay that describes these and other issues that take place in musical performance is by Elaine Goodman (now King) (2002) in her chapter “Ensemble Performance.” Goodman explains and addresses four pertinent issues experienced by small chamber groups. These include: keeping time, aural and visual communication signals, the role of the individual, and social factors. The first two issues she addresses are of particular interest to this study. Specifically, she relates nonverbal communication through sound and sight to skills of anticipation and reaction in timekeeping within the group, focusing on the predictions members make based on reactions gained through reciprocal feedback loops.\(^{36}\) While addressing aural communication she further explains that minute adjustments are constantly being made, either consciously or unconsciously, while the performer’s concentration is divided between monitoring his or her own sound and the sound of the group.\(^{37}\) While recognizing the benefits of visual communication, Goodman also questions its usefulness in this context, acknowledging that some players see it as detrimental to the spontaneity of performance if too much awareness or focus of the player is placed on that means of communication.\(^{38}\)

Another issue Goodman develops is the relative value of planning nuanced expression during rehearsal, and the negative impact it can have on a performer’s ability to adjust during performance. While acknowledging that some planning may be necessary so that performers understand and can respond to each other, Goodman notes that some musicians regard too much

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\(^{37}\) Ibid., 156.

\(^{38}\) Ibid., 158.
planning as unfavourable. This relates to this study because a great deal of the nonverbal interaction that happens during performance is dependent on each performer’s ability to respond and react to musical variations or deviations that occur. This attunement to change connects with the work of Seddon and Biasutti and their realization of the positive impact the state of empathetic attunement has on music making between professional musicians. Indeed, the emergence of empathetic creativity from this state suggests that those moments are spontaneous rather than pre-planned. Nevertheless, the amount and quality of rehearsal may affect musicians’ ability to communicate or interact at different levels of attunement. This is suggested in another study by Tovstiga et al. (2005), in which one of the co-authors was the cellist of the professional string quartet that participated in the investigation. Tovstiga et al. expand upon Seddon and Biasutti’s idea of “spontaneous musical variation” during performance, emphasizing that it is actually a balance between spontaneous interaction and rehearsed coordination. They conclude that the ability to communicate through nonverbal cues is developed and sharpened through rehearsal and long-term engagement between players. Even so, there are also types of nonverbal communication that do not depend on rehearsal, which are more global than particular to a single person or ensemble. Although I will not be investigating the impact of rehearsal processes on performance, when applicable I will refer to how nonverbal cues can facilitate inspired reaction and empathetic creativity within performance, whether global or particular.

In the investigation by Tovstiga et al. (2005), the researchers’ primary interest is knowledge acquisition and sense making in string quartets, which they view as “complex learning organizations.” They propose a model called “field of interaction,” that views individual contributions as opposed to the collective mechanisms and implicit processes of musical and social behaviours as opposed to explicit ones. These four categories come together in the middle, in the field of interaction, where the quartet manages these different processes while making music together. Their focus on implicit and tacit processes in group situations affirms the idea that successful string quartets manage both musical and social issues implicitly, a conclusion


40 Tovstiga, Odenthal, and Goerner, “Sense Making and Learning in Complex Organizations,” 228.

41 Ibid., 222.
similar to the findings of Murnighan and Conlon (1991). These findings point to an important aspect of this study: I ask string quartet performers to discuss some of the nonverbal processes that they use to communicate musically with one another. Because many of these processes happen implicitly within the group it is likely that they may be difficult to articulate.

One of the first major studies done on a professional string quartet—and in many ways a foundational text for all subsequent work in the subject—is *The Art of Quartet Playing: The Guarneri Quartet in Conversation with David Blum* (1986). There are many publications about the now-retired Guarneri String Quartet, including those by Ruttencutter (1980), Fink and Merriell (1985), Blum (1986), and the first violinist of the Guarneri himself, Steinhardt (1998), as well as a number of journal and newspaper articles. However, *The Art of Quartet Playing* by Blum is widely cited by scholars within string quartet literature. This study is based on round-table discussions with the ensemble’s musicians. Blum, himself a conductor and long time friend of Steinhardt’s, offers an exploration of the group’s collective musical interpretation of Beethoven’s Quartet Op. 131 in c-sharp minor in an effort to show the process by which the performance is shaped. In their discussion with the author, the musicians consider issues that arise in their individual parts, between two and three parts which are interconnected, musical issues that affect the group as a collective, the meaning of the composer’s markings, and unique choices that they make both as individuals and as a collective. One key passage from the book that is cited in subsequent studies (e.g., Goodman 2002) concerns the rehearsal process and complementary and challenging issues that take place within it. Here, John Dalley, the second violinist, says that although one interpretation may “win,” as it is most convincing at that moment, “there’s a constant working-out process” that continues throughout the rehearsal or the various renderings of the piece.\(^42\) This implies that there is a lot of fluidity in the way a string quartet works, and that its decision-making is often based on what works best for the group at any particular point in time.

1.3 Theoretical Foundations for the Study of Interaction and Communication

An important book for outlining many issues relevant to this dissertation is *Knowing Music, Making Music: Javanese Gamelan and the Theory of Musical Competence and Interaction* by Benjamin Brinner (1995). In proposing a theory of musical interaction intended to have broad applicability, Brinner develops his theoretical model by focusing his attention on musical interaction in Javanese gamelan performance. He then draws on examples from many different musical traditions (from music of Western cultures to traditions in Africa, the Middle East, and other parts of Asia) to illustrate his assertion that it is possible to generalize the relevance of his theory of interaction to music making in different social contexts. Using this framework, Brinner theorizes and later applies four interactive “domains:” network, system, sound structures, and motivation. He stresses that these domains overlap in many ways and that a theory of interaction ideally includes all of these “mutually illuminating” elements. The domains applicable to this study, which include interactive network and interactive system, will be discussed and applied to the context of nonverbal processes in string quartet interaction.

Interactive network considers leadership and roles, particularly in relation to degrees of control or influence within a group. A key point Brinner raises is the complexity of the relationships between those given leadership roles and those in supportive or following roles. Brinner first points out the inability of these terms to denote the finer nuances of what is actually happening in musical interaction. He also refines definitions of supportive musical roles and their impact on the group and/or performance. These points are important for understanding processes within the string quartet, an ensemble that exemplifies a group without a designated leader, as is the current trend in string quartets in North America. Central here is that both leading and following and especially the nuanced interactions between leaders and followers in performance take place almost exclusively via nonverbal communication.

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44 See Gilboa and Tal-Shmotkin (2010).
Brinner’s analysis of interactive systems draws strongly on a careful consideration of communication and coordination between performers. To this end, Brinner focuses on and elaborates different types and facets of cueing. These include a variety of acts such as cues, responses, prompts, signals, and markers.\(^{45}\) He considers conventional and idiosyncratic cues, timing and predictability of cues (interactive determinacy), and outlines all the possibilities for cueing and response, which he considers the basic unit of interactive communication.\(^{46}\) While Brinner discusses cueing in consideration of all different types of musical traditions, in string quartet practice and performance the musical score typically guides most of these cues, therefore somewhat limiting the cue in relation to timing and predictability. This falls into what Brinner calls the fourth level of interactive determinacy where “the cue reaffirms a planned action rather than conveying new information.”\(^{47}\) He more specifically calls this type of information exchange “signals,” which he defines as predictable cues.\(^{48}\) This distinction is important because Brinner analyzes various instances of music making (including jazz and Javanese gamelan) where either timing or predictability may be unknown. In comparison to these other kinds of music making, any type of string quartet “cue” would seem very predictable. However, I would argue that even when string quartets perform from highly-detailed notations of pre-composed music, there is a sufficient amount of unknown information that must be communicated spontaneously between musicians that the notion of signals as offered by Brinner flattens the many nuances, processes, and stakes involved. For example, timing and predictability not only vary, but they do so in more subtle ways than those Brinner discusses. Furthermore, emotionally inspired variations related to individual interpretation or unexpected aspects in the performance itself are but a few other points of uncertainty in what is an otherwise precisely preplanned performance. This suggests that Brinner’s concepts can be further developed with respect to precisely notated music such as string quartet compositions.


\(^{46}\) Ibid., 184-88.

\(^{47}\) Ibid., 185.

\(^{48}\) Ibid., 190.
In his conceptualization of interactive system, Brinner also notes the effects of the positioning of performers on their ability to communicate with one another. Depending on where each member is placed relative to the other, players will be able to hear and see different people with varying degrees of ease or difficulty. Over time, understanding develops around the specific types of aural and sonic feedback available for each member and the group as a whole. With this particular kind of knowledge, competences develop around what players need to do to aid any type of communication that might be blocked or inhibited. Of course if groups are playing in different venues or halls, members in the group have to quickly adapt to the new environment.

In contrast to Brinner, who develops a system for analyzing interaction in all kinds of ensembles, McCaleb’s (2014) theory of interaction centres around the reactive processes that occur specifically during ensemble performances of Western music. Included in his research are analyses of rehearsals of a post-graduate string quartet and a performance of a mixed improvised ensemble. Both theories, however, focus around the concept of interaction with communication happening within the larger framework of interaction. To begin, McCaleb uses action research, with himself serving as reflective practitioner, to develop a compelling argument for the nature of ensemble performance. McCaleb stresses the reactive and often unintentional nature of interaction that happens between musicians during performance, which leads him to develop his theory of “inter-reaction.” Based on paradigms of interaction and reaction, this new theory incorporates the effects of unintentional actions during performance. His work questions the ways that musicologists have tended to frame their studies of qualitative musical information. He maintains that musicologists have uncritically applied concepts drawn from communication studies that are based on explicit processes of encoding, transmission, and decoding. He argues that this paradigm implies that information exchange is uni-directional and explicit, where “information is ‘pushed’ from one person to another through intentional action on behalf of the sender.” McCaleb adds that this foundation, especially the aspect of encoding, is not really representative of the flow of information that happens between performers. Through examination


50 Ibid., 61.

51 Ibid., 42.
of a string quartet rehearsal he concludes that the stages of transmission and decoding remain relatively intact, but that the stage of encoding does not account for unintentional actions while playing.\textsuperscript{52} McCaleb’s contention is that his framework allows for both intentional and unintentional exchanges or sources of information to be integrated into the ongoing unfolding group interpretation of the piece during performance. He writes, “This framework therefore allows for the creative flexibility and spontaneity that is often prized within ensemble performance in Western art music without rejecting the possibility of explicit communication between co-performers.”\textsuperscript{53}

However, some of McCaleb’s claims and arguments against the use of communication paradigms seem based on definitions that are excessively rigid and tend to overlook how his concerns have been addressed by previous communications researchers. For example, creativity, learning, and collaboration scholar R. Keith Sawyer (2005) actually argues against understanding information exchange of social communication or musical communication as explicit and unidirectional, which he finds misleading for definitions of communication used in social or musical contexts.\textsuperscript{54} He says such strict definitions do not capture the truly collaborative and communicative nature of conversations or musical communication.\textsuperscript{55} Thus, while I agree with McCaleb that communication processes in social interaction do differ from communication processes that happen in musical interaction, if the musical context is referenced and a cross-modal model of communication is used, I would also argue that communication paradigms could be used to study music performance.

Despite these limitations, the emphasis that McCaleb places on the importance of reaction in music performance is a significant contribution. His main argument is that performers are continually responding to their environment, both aurally and visually, and that their primary focus is aural involvement. Based on this principle he developed a cyclical theory of inter-

\textsuperscript{52} McCaleb, \textit{Embodied Knowledge in Ensemble Performance}, 44.
\textsuperscript{53} Ibid., 107.
\textsuperscript{55} Ibid., 54.
reaction, which is based on three stages that include transmitting, inferring, and attuning. Briefly these stages are related to 1) performers’ musical intentions as communicated through the instrument; 2) the ability of co-performers to infer these intentions based on extensive embodied musical knowledge; and 3) constantly monitoring and adjusting both personal and group actions to achieve an overarching integrated interpretation.

McCaleb also explores in depth the relationship between the performer and his or her instrument. This relationship affects the interactive processes that occur during group performance, as this is a major part of the performer’s means of communication within the ensemble. He investigates each performer’s goals, intentions, and subsequent actions and the impact this has on the development of group outcomes. Like McCaleb, I too will examine the different ways that string quartet musicians use the relationship between their instrument and different situations in the score, to infer information from their colleagues in order to synchronize their playing. While McCaleb analyzes inter-reaction during a string quartet rehearsal, I will refer to and elaborate upon the kinds of nonverbal communication that occurs during string quartet performance and also comment on the intimate relationship between initiation and reaction.

2 Conclusion

Music performance is difficult to study for a number of reasons, not the least of which is the fleeting nature of sound and the action needed to produce it. In the last few decades, there have been many valuable additions to the literature on string quartet functioning and performance. In contrast to many ethnomusicological studies in which researchers learn to play instruments of a foreign musical tradition, studies on string quartet processes rarely utilize such a methodology. David Blum and J. Murphy McCaleb are two of the few musicians to publish research on string quartets in which the scholar is an active performer, although neither are string quartet performers. Other studies have involved interviewing string quartet performers, in particular by Tovstiga et al. (2005) with co-author Stephen Goerner, cellist of the Carmina String Quartet. Seddon and Biasutti (2009A) studied the Paul Klee String Quartet by videotaping rehearsals and a performance and conducting checks with the members after analyzing the video footage. The performer’s perspective adds depth and integrity to these studies, as these are the people involved in the act of performance and have first-hand experience in rehearsal and on stage. Even with these promising contributions, there are areas that still need to be researched. Many
processes, both explicit and implicit, that take place during string quartet performance remain undefined, under-explored, and are often taken for granted.

The still-nascent state of performance research is very much explained by both the difficulty of doing such investigations and the related need to develop methodological approaches that will reveal new kinds of understanding. While the work of Seddon and Biasutti has identified categories of verbal and nonverbal communication processes and levels of attunement within string quartet rehearsal and performance, further investigation is needed to explore how and when these categories and levels occur. Although Tovstiga et al. have revealed important information about professional string quartets through the lens of sense making and learning, they support their ideas mainly through theoretical concepts and not through direct analysis of performance. The theoretical concepts developed by Brinner and Goodman, addressing different kinds of ensembles, contrast the more practice-specific and detailed approach of Blum. Each is beneficial in its own regard, but merit wider application. McCaleb on the other hand, initially joins the theoretical approach with the practical approach, but ultimately is more concerned with philosophy and phenomenology in his effort to propose a new theory.

As this dissertation will illustrate, careful consideration of nonverbal communication through a combination of score analysis, hands on experience, video analysis, and interviews with performers, is one such avenue of understanding both theory and practice. My consideration of nonverbal communication will query the nature of musicians’ roles and interactions in string quartet performance and relate them to the repertoire being performed. I will also consider how roles, interaction, and most of all, forms of nonverbal communication change depending on different styles of music. All of this makes it possible to better understand how different aspects of nonverbal communication make it possible for string quartets to navigate musical scores, calling into relief my contention that multiple modes and channels of sensory reception of nonverbal communication interact during performance. This approach, finally, will add nuance and better understanding of the processes and conditions of elite string quartet practices as I have come to know them from years of practical experience.
Chapter 3
Methodology

1 Participants

Each of the five professional groups chosen to participate in this study, including my own group the Cecilia String Quartet, is recognized for being an elite ensemble with a variety of musical specializations and also a diversity of regional affiliations and influences. All the groups are currently based in North America. At the time of the interviews one of them had been together in the same formation for ten years; two recently experienced member changes; and the other two ensembles, including my own, have had the same members for four years. A mix of groups, some with musicians who have played together for a long time and others that have a combination of founding members and those who have more recently joined, will help clarify which communication processes are more explicit and which are more implicit.

Other aspects of ensemble formation also inform issues related to nonverbal communication and should be mentioned. Two of the groups adopt the “European” seating position (i.e., from left to right from the audience perspective, first violin, second violin, viola, and cello), while the other three groups, including my own, adopt the “North American” seating position (i.e., from left to right, first violin, second violin, cello, and viola). None of the groups adopt the “German” seating position (i.e., from left to right, first violin, cello, viola, and second violin). None of the groups stand while playing. In one of the groups the two violinists switch instrumental parts; in the other four groups the violins either play first violin or second violin exclusively. Throughout this dissertation, these variables will be broached as necessary in relation to the different kind of nonverbal communication under consideration.

56 For the sake of privacy I will not be including any of the personal names of either the string quartets or the individuals who make up the string quartet in this study, except to recognize that I am a member of the Cecilia String Quartet and to name my group in the Video Analysis in the Appendix. I have given each of the string quartets a random identification: String Quartet A, String Quartet B, String Quartet C, String Quartet D, and String Quartet E. I will, however, indicate which instrumentalists made the comment: Violin 1, Violin 2, Viola, or Cello. In the string quartets where the violinists switch positions I will simply write Violin.
My string quartet is comprised of four females, one other group is all male, two groups have two males and two females, and another group has three males and one female. For this study, groups were selected in part to minimize the effects of gender bias on results. Other issues related to, for example, age, experience, fame, and other markers of authority were not specifically addressed but, as Brinner (1995) notes, do likely affect musical interactions and therefore communication. This study will simply acknowledge that there are factors that can affect the nonverbal communication in string quartet performance that will not be examined here.

2 Description of Method

This is a qualitative study focused on five case studies. Score and video analysis along with interviews with the members of five string quartets are the key data gathering techniques. Interviews were conducted individually with each musician and focused on their understandings of nonverbal communication and how it is used to facilitate cohesion and spontaneity during performance within the respective ensembles. In addition, two of the groups were interviewed about specific excerpts in their performance of a single piece of music.

Professional string quartets often have very busy schedules, so the collection of video data for each group was restricted to one performance day. The interviews were then conducted at the convenience of the individuals within the groups. The video and interview data for this investigation was collected between September 2013 and August 2014. The information gathered from interviews and analysis was, in many instances, related to my own experiences as a violist with the Cecilia Quartet. In some instances, further, I draw primarily from my experiences and corroborate them with what other musicians told me and what I observed when analyzing their performances.

3 Collection of Data

3.1 Collection of Video Data

All videos were made during public performances because, as emphasized in chapter 1, in this setting communication processes and exchanges that occur will be nonverbal. Also, in the performance context, as Seddon and Biasutti point out, it is more likely that performers will be empathetically attuned with one another and involved in creating “spontaneous musical variations,” a phenomenon that influences nonverbal behaviours and communication. To capture the performances it was necessary to place the camcorder on a tripod, usually toward the middle or back of the hall where it would be least disruptive to the audience. The pieces that were recorded came from various time periods and styles and included Haydn String Quartet Op. 20 No. 4 in D Major (1771), Schubert String Quartet No. 12, D. 703 Quartettsatz (1820), Haydn String Quartet Op. 33 No. 3 in C Major “The Bird” (1781), Webern Op. 5 Five Movements for String Quartet (1909), and Beethoven String Quartet Op. 59 No. 2 in e minor (1806). While these pieces represent a wide range of stylistic differences, they were also the pieces that the performers preferred that I capture. This may influence my interpretation of the processes of nonverbal communication because different styles of music may encourage groups to communicate nonverbally in different ways. Also, their familiarity or favoring of these pieces might inform the kinds of communication engaged in during performance, which would also affect the potential, frequency, and duration of the players’ empathetic attunement with one another. While there are many variables related to the type of music performed that might inform nonverbal communication between musicians, a musical characteristic that emerged as a central concern was the presence or lack of a consistent pulse and/or metre in a given piece. As I will discuss, the kinds of ongoing communication between musicians changed in the absence or presence of a strong and common temporal reference.

58 Seddon and Biasutti, “Modes of Communication Between Members of a String Quartet,” 133.

59 Initially I wanted to have three cameras capturing data during performance, two on either side of the string quartet and one camera focused on the centre of the group. Having these cameras would have increased the amount of information I was able to observe about the use of vision and visual signals. I would have been able to see and hear the use of breath more distinctly, and observe the more subtle nuances of movement and gesture that the groups used. However, it is important that this kind of research is done in real performance settings, and in high profile performances as well, but unfortunately this kind of camera set-up would have been too disruptive for such performances.
3.2 Collection of Interview Data

The interview data was collected individually and at varying times in relation to the analyzed performance. With my string quartet, the interviews took place about three weeks afterward. With three of the other groups the interviews took place on the day of the performance—two prior to it and one immediately following its completion. The interviews with members of the remaining group took place between one week and two months after their performance (this was due to illness). With two of the groups, including my own, part of the interview process included looking at video of and responding to a few excerpts from the performance. I chose these excerpts based on musical material that demanded and encouraged moments of nonverbal interactions or the use of nonverbal cues between the performers, as opposed to cues for the benefit of the audience. This was based on my analysis of the score, familiarity with the piece, and the knowledge of string quartet performance that led to my inference that nonverbal communication was necessary. These excerpts featured characteristics such as the beginning of a movement within a work, material that featured musical dialogue between members (for either individuals, duos, trios, or the whole group), moments that seemed to challenge the group artistically or technically, or moments where the group seemed more engaged with one another for musical reasons. Unfortunately, due to time or availability constraints, I was unable to conduct feedback interviews with the other three groups. For all interviews, however, I asked the participants to identify characteristics of nonverbal communication more generally and to explain how they used nonverbal communication within their group. The individual interviews ran anywhere from eighteen minutes to one hour and ten minutes. I purposely wanted to conduct individual interviews in order for each participant to be able to talk freely about their experience of nonverbal communication within the group, and to ensure that I collected everything that they wanted to say on the topic. However, being constrained to speak only about the actual performance with some of the participants might limit the breadth and the possibility of generalizations of the study inferences. Nevertheless, their comments in conjunction with video analysis of performances and my own experiences performing produced a number of new understandings and also provided useful foundations for future studies of specific issues raised here.
4 Interview Process

The interview process was semi-structured. Participants were not given the interview questions ahead of time. Although my initial focus for the study, and therefore the first interviews I conducted, was restricted to nonverbal communication and spontaneity in string quartet performance, it expanded to explicitly include the use of gesture. The importance of gesture became apparent when interviewing my own group (the first interviews I conducted)—the members of which spoke about it frequently, especially in relation to body movement. At that point, I informed the other participating groups that I was interested in studying nonverbal communication, spontaneity, and gesture.

The interviews were guided by a series of questions found in Appendix 2. Some questions were answered directly and others were broached unintentionally while a participant was discussing a different topic. At those times, I questioned the participant about a related topic that he or she had introduced, even if those questions were not part of my original series of questions. I wanted the participants to experience the interviews as a natural discussion or brainstorming session between string quartet players. Accordingly, I encouraged participants to talk freely about their perceptions and thoughts. The general areas of conversation included: 1) their education and background influences (as they relate to movement and gesture), 2) general characteristics of nonverbal communication that they think string quartets use, and 3) particular nonverbal characteristics that they think their own group uses during performance.

I was able to question my own string quartet at greater length because they were willing and able to give extra time to the interview process, allowing me to cover all of the question topics in detail. Time constraints with the other groups meant that I covered some of the topics in less detail, but this is not to suggest that these interviews were less useful. On the one hand, familiarity with members of my string quartet might have engendered longer conversations; in other cases, the lack of familiarity with an interviewee might have inclined them to explain things more fully rather than assume I understood what they were discussing. In all instances, the dynamics of interpersonal relationships cannot be ignored and, therefore, all interview data is treated critically and is subject to a degree of interpretation.

For one of my questions (i.e., “What are the characteristics of nonverbal communication that are shared by groups, or by your group during performance?”), it soon became apparent that the term
“characteristics” was confusing to participants and the question difficult to answer. So I started to use the word “tools” instead, which resolved part of the problem. In addition, I reframed the question to make it more accessible. It became, “What are some of the tools that you use to communicate with your colleagues while you are on stage?” which seemed to resolve another problem as participants were able to better grasp the meaning of the question and respond accordingly. Part of the difficulty may have arisen because players spend very little time actively thinking about nonverbal communication. Furthermore, the word “characteristics” may have been confusing in this context because string quartet musicians use the word “character” frequently to describe music when they talk to one another about emotional or expressive elements of music.

4.1 Interview Analysis

I transcribed all nineteen interviews and initially examined twelve of them individually, attempting to identify major themes and categories. Unable to integrate all of the different issues raised by the participants, I began searching each of the interviews for references to the aspects of nonverbal communication (used to enhance performance) that I was interested in exploring: breath, facial and eye expression, the use of vision, and gesture and bodily movement. For example, I searched for specific words such as “breath” in the transcription of every interview. Then I created a new document consisting of all the statements in which participants used each term. I did this to ensure that I considered and included every aspect of each mode and sense that the participants addressed.

I then based the content of the chapters on the modes and channels of sensory reception that I selected for study at the outset. These were: the use of vision, visual cues and contact, breath, and body movement and gesture all in the context of aural information. One major theme that emerged immediately from the interviews was leadership in the string quartet. Where relevant, this issue has been integrated into each section. The topics within the chapters emerged from the interviews and my own observations. Throughout the dissertation I also include many of my own ideas about particular topics and issues, largely based on my own experience. If a theme did not arise from the interview process and I thought it important to the topic I added it to the appropriate discussion, using other scholars’ research to support my own thoughts.
4.1.1 Emergent Themes and Conceptual Notions

There were two themes that, upon completion of the interview process and analysis, I realized were of particular importance to the use of nonverbal communication between string players. The first was the difference between conceptualizations of technique and gesture, which both involve the body and how players use their body to play their instrument. In general, I came to view technique as something developed while students learn to play the instrument. It involves being able to automatically manipulate the instrument to play even very difficult passages. Gesture, on the other hand, I relate to a performer’s mental conception of the score and their part, as embodied through their instrument. The second key theme that emerged during the interviews and analysis is the musicians’ personal and distinct use of eye movement and vision in relation to auditory information. There are many different forms and functions of eye movement and vision that musicians use, all of which are more or less beneficial at distinct times and in various situations.

There were also three conceptual notions that emerged as relevant to the material I was analyzing in the interviews. These were 1) Jakobson’s linguistic concept of multi-functionality, which helps explain the focus of musicians’ attention on different temporal levels of music, 2) the idea of cross-modal phenomena that Fatone et al. (2011) discuss in their article “Imagery, Melody and Gesture in Cross-Cultural Perspective,” which accounts for the interaction between gesture and cross-modal actions as located within musical performance and transmission, and 3) Keller and Appel’s concept of anticipatory auditory imagery, which provides insight into the coordination of ensemble members in performance.

In his linguistic concept of multi-functionality (1960), Roman Jakobson recognizes that different dimensions of language alternate between the “foreground” and “background” during verbal interaction. Ethnomusicologist Harris Berger introduces and uses Jakobson’s concept in the context of music performance in his article “The Practice of Perception: Multi-functionality and Time in the Musical Experiences of a Heavy Metal Drummer” (1997). 60 Berger proposes that different levels of temporal attention coexist simultaneously in varying states of foreground

and/or background in a performer’s attention. This concept can also be applied within the various channels of sensory reception of nonverbal communication, which include vision and sound. Building upon Jakobson’s concept, Berger observes, “to say a sphere of experience is multi-functional is to say that it has numerous simultaneous dimensions, each of which is always operative and each of which may take the foreground of attention at any moment.” As it applies to nonverbal communication in a string quartet, the key is that all incoming communication during performance typically involves multiple levels within each channel of sensory reception. I will refer to these multiple levels as “sub-channels.” Musicians hear the music, focusing on different parts of it; they hear themselves or other musicians breathing; they read their scores; they see various facial and bodily movements, gestures, and breath in various combinations and with differing degrees of focus at various times. At the same time, they are also very quickly balancing focus between the visual and aural senses as necessary. Rarely if ever does one sense exist in true isolation among performers, yet string quartet players may “foreground” a sense to the degree that it takes precedence and therefore seems isolated.

In addition to Berger’s study of multi-functional perception during performance, Fatone et al. (2011) explore the occurrence of cross-modal phenomena during music making. Although they are not studying the use of such phenomena between co-performers, they investigate how auditory, motor, visual, and conceptual counterpoints “may be integrated, generating a unified meaningful action.” In the article they explore four different examples of how gesture is located “within a complex of cross-modal actions associated with musical performance and transmission.” In the different case studies several approaches are used to investigate this: attention to the multiple ways that gesture may function, querying how imagery and gesture are involved in the process of constructing musical meaning, and examining the parallels between

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63 Ibid.
physical gesture and sound. Although their focus is on how gesture is integrated in cross-modal phenomena, this idea can be applied to how the modes and channels of sensory reception of nonverbal communication interact with one another. In my formulation, most modes involve sending nonverbal information, while the senses receive information from the multiple modes simultaneously and process this information through different channels. This flow of information, in which an individual sends and receives information, happens concurrently and is continuously ongoing as musicians make music together.

While the concepts of multi-functionality and cross-modal phenomena help explain reception of different information and processing this information through different levels of attention, the concept of anticipatory auditory imagery helps explain how members of a string quartet begin and continuously coordinate with one another. A recent study by Keller and Appel (2010) investigated individual usage in relation to anticipatory auditory imagery. According to Keller, anticipatory auditory imagery is one of three cognitive/motor skills that determine the quality of musical coordination in ensembles. By auditory imagery they mean musicians’ use of mental imagery to aurally envision the production of their own and other musicians’ upcoming sounds. In this study Keller and Appel found that there was a relationship between individual differences in anticipatory auditory imagery and ensemble coordination. To explain, Keller and Appel offer two internal models of anticipatory auditory imagery: 1) forward models which represent the causal relationship between different motor signals and the sounds they create and 2) inverse models which represent sensorimotor transformation from desired sounds to motor commands that give rise to these outcomes. When playing with other musicians the individual’s forward-inverse model of their own actions is paired with a backgrounded forward-inverse model that an individual has of the other musicians’ actions. This backgrounded forward-inverse model specializes in anticipating those other musicians’ sounds. These cognitive/motor abilities allow

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64 Fatone et al., “Imagery, Melody and Gesture in Cross-Cultural Perspective,” 204.
66 Ibid., 40.
corrections to be made between players on the basis of anticipated relation of musical parts rather than just in response to actual discrepancies.\textsuperscript{67}

Anticipatory auditory imagery can be related to multi-functionality because different levels of vision and sound (i.e., hearing ahead, visualizing) play a role in preparing the individual’s body and mind for action while realizing a nuanced understanding of the expected actions of the other musicians. This relationship also helps maintain the ongoing process of managing the perception of different levels within the sub-channels of sensory reception as players anticipate and react to their co-performer’s actions. The concepts of multi-functionality and cross-modal phenomena allow me to explain and expand upon the nonverbal phenomena that the participants were describing to me. Anticipatory auditory imagery is helpful to explain how musicians play together, particularly when starting from silence.

4.2 Video Analysis

Analysis of small excerpts from the videos—rather than viewing the performance as a whole—proved very enlightening. Viewing these moment-to-moment interactions that take place in string quartet performance makes clear the nonverbal processes that occur between co-performers in great detail. The excerpts analyzed were chosen because they illustrated different kinds of nonverbal interaction between the performers. Based on multiple viewings in slow motion, I was able to identify many of the different processes that were going on between performers. Not usually accessible to external observers—especially at full speed—these processes are important in terms of musical shaping for the group. I checked these moments against the score to obtain a thorough understanding of the structure of the musical passage in relation to the nonverbal processes that I noted were taking place. There are six short video analyses included throughout the dissertation. There is one longer video analysis included in Appendix 1: Video Analysis of the Cecilia String Quartet. I included this because I was able to collect feedback twice from members of the Cecilia String Quartet: once about a week after the performance and then again almost a year later after I had analyzed the passage.

\textsuperscript{67} Keller and Appel, “Individual Differences, Auditory Imagery, and Coordination of Body Movements and Sounds in Musical Ensembles,” 40.
Ideally I would have done feedback interviews using video of the performance with all of the groups as soon after the performance as possible. These feedback discussions would have been beneficial, as they would have helped clarify the intention behind the nonverbal communication and cues, and their effectiveness based on the observed response. I would have been able to better distinguish between, for example, which gestures are used to create sound; which movements are directly related to musical communication (cues, responses, signals, and markers) or expression (as related to musical meaning) between musicians; and which are more expressive movements aimed at the audience. Fortunately, I was able to interview one group right after their concert (without video-feedback), and they inadvertently included information about the repertoire that they had just performed because it was fresh in their mind. Despite the challenges and limitations mentioned above, these interviews and the others as well most certainly enabled me to collect a wide range of information about group functioning that allowed me to infer information about the video footage with some certainty.

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68 Brinner, Knowing Music, Making Music, 183.
Chapter 4

Face, Eyes, and Visual Signals

1 Introduction

In this chapter, I explore how the ability to see and be seen during performance affects a performer’s coordination with other members of a string quartet and the resultant musical expression. All participants in the study mentioned some aspect of their use of vision during the interviews. It was notable that nearly all the musicians addressed the topic without prompting. While vision is an obvious point of entry for studying nonverbal communication, its use by string quartet musicians is far from simple.

Visual communication is often central to helping ensemble members develop and maintain interpersonal connection and achieve musical coordination. At the very least, a great deal of information can be gleaned by watching musicians perform since producing sound on a musical instrument requires bodily motion. This fact lies at the centre of the study of gesture in music (see chapter 6), an area of research that has seen increased attention in recent years.69 As one participant in my study noted, “gesture implies something visual” (interview with Violin 2 String Quartet A, January, 2014). The implication is that, in her view, any type of movement during music making has the potential to be seen and understood. On the other hand, as several participants commented, sometimes movements can just be “sensed” or “felt,” and they do not necessarily have to be seen directly. My focus in this chapter, however, remains on those movements during performances that are seen and made sense of by members of string quartets.

2 Eyes

During performance all members of the string quartet face one another in a semi-circle, so everyone is able to see each other, albeit with varying degrees of clarity. While the most obvious function of the eyes is to receive visual information, I noted that string quartet musicians also use their eyes to send information at the same time. This capacity to simultaneously send and receive information provides an important means of connecting and maintaining connection with one

69 For example, Gritten and King 2011 and 2006, Godøy and Leman 2010, and Hatten 2004.
another (visual interaction). However, most of the discussion in this chapter surrounds how the eyes and their ability to see are used as a tool for reception and understanding. As will be discussed, sending information directly through the eyes is used at very specific times between group members.

There are many ways in which the eyes aid in the exchange of information between performers. Facial expressions, especially those involving the eyes, can be understood as a natural reflection of internal emotional states (Ekman 1975). This understanding can engender effective nonverbal communication especially when those involved know each other well. As one participant pointed out when discussing his perception of his own communication via eyes and face, “this is what you are feeling, you are expressing it, and so those cues can be grabbed from those people you are playing with” (interview with Violin 2 String Quartet D, November, 2013). Clearly, this musician views visual communication involving the eyes and face as direct and effective.

The comments of several participants as well as my own experiences as a performer suggest the importance and efficacy of eye and facial communication. However, the limits of this manner of information exchange should also be noted. For example, players are only able to focus their visual attention in one place at one time, either at their music, themselves, another colleague, or even into the audience. With only one line of direct vision, musicians are not able to look in a detailed way at all three of their colleagues at the same time. That being said, humans are able to shift their visual attention very quickly. In addition, peripheral vision can be used effectively to monitor inter-performers behaviours and actions, when looking directly is not possible or ideal.

The combination of visual focus with that of peripheral vision has the potential to provide a wide range of general visual information.

At this point it is helpful to recall Jakobson’s linguistic concept of multi-functionality (1960), in which he recognizes that different dimensions of language are foregrounded—that is, they become a point of focus—or are shifted to the background at different times during verbal interaction. Berger uses this concept to show that different levels of temporal attention coexist simultaneously in varying states of foreground and background in a performer’s attention. 70 This

concept can also be applied to that of visual interaction, in that humans have the ability to take in different kinds of information simultaneously through the use of different types of vision. Generally, that which is at the centre of focus might be said to be foregrounded while peripheral vision, including that which is to the sides, in front, or well behind the focal centre, are backgrounded. However, the information that peripheral vision can provide co-performers at any given point may prove to be most beneficial. In a sense, then, the field of vision that is typically assumed to be background is actually foregrounded in terms of information processing. For example it is possible to read notation with a rather automatic process even if it remains at the focal centre, while actually focusing greater attention on movements to the side, in front of, or behind the music stand, especially those of the other musicians. Two possibilities for understanding this use of vision are: 1) different levels of visual attention coexisting simultaneously with the slight foregrounding of what would otherwise be backgrounded or 2) a rapid switching between foregrounding focally centered and peripheral vision. Pinpointing which of these is more accurate (if indeed one is more so than the other) would require further research. Nonetheless, the human ability to shift visual awareness and focus at a very fast rate, or to process foregrounded and backgrounded visual information more or less simultaneously can provide players with a great deal of perceptual information, provided they have developed the required skills. My study has shown that elite performers have the ability to make decisions, and indeed develop competences, around the kinds of visual information that will best serve them at any time and how to access it.

3 Eyebrow Movements

There are numerous idiosyncratic non-sound producing movements that have explicit meanings for certain performers in specific musical contexts. With respect to eye-oriented facial features, two different movements holding explicit meaning involve the eyebrows. The eyebrows are important as a means of communication because they have the capacity to move rather freely and often expressively while playing a string instrument. Two participants noted that for their groups the following meanings could be usefully inferred: 1) raised eyebrows during a performance suggest a happy time and 2) raised eyebrows before the movement starts mean to begin it softly. While several participants mentioned eyebrow communication, I have not used it as a means of understanding or “reading” my colleagues, in part because I understand that eyebrow movement, like many cues, is not a precise means of communication, nor necessarily purposeful. For
example, while two different participants interpreted eyebrow movement in the above ways, my own understanding could lead me to interpret these same gestures as indicative of uncertainty. Seeing the entire face, however, would likely help eyebrow movements be more clearly understood.

The larger and vital point is that nonverbal communication such as eyebrow and even eye movement is highly dependent on when in a performance it takes place and between whom. The fact that eyebrows were discussed as a useful source of cueing information by some, but not all of the musicians, suggests that what they convey may be more idiosyncratic and thus only useful for group members who have some familiarity with each other. The possibility of co-performers (as opposed to onlookers) using this type of information will be discussed later in this chapter, and there is a brief analysis of eyebrow movement as a means of communication in Appendix 1: Video Analysis of the Cecilia String Quartet. However, similar to facial expressions, the eyebrows may be a reflection of the movement and expression of the music that a player experiences during performance. This leads us into a discussion about the understanding of different types of visual information that are accumulated over time.

4 Reading Co-performers

The kinds of visual information that can be exchanged among performers, especially information involving the face, would seem to be quite intuitive, at least among people with similar cultural backgrounds. This is because facial movements are often made unintentionally or as a byproduct of some other action, intention, or emotion. String quartet musicians are not trained to control their facial expressions, as actors are. This means that their faces are a more transparent expression of their internal state. Yet as I suggested above, there is room for misinterpretation, so familiarity between performers is very important.

In general, professional string quartets involve fixed membership that can last for many years. Also, performance preparation often involves extensive rehearsal. Thus, members often have so much experience being around one another that they build up a shared understanding about the meaning of different expressions in particular musical contexts. “I can actually give him more of a look, I can say ‘hey I’m going to do this,’ and he can pretty much read me and vice versa with more of a facial thing” (interview with Violin 1 String Quartet D, November, 2013). In this interaction, the information that the first violinist is directing at his colleague is very explicit, and
communicates what is coming next. Typically, the longer musicians play together the more reliable and effective this database of information can be:

First of all, there’s eye contact, and the potential for information to be shared through the eyes. But [that] requires you to know a person on a certain level. So the deeper you know them the more effective that can be because what happens around the eyes, or the eyebrows, or just how someone is setting their eyes, gives you a lot of information. (interview with Violin 2 String Quartet D, November, 2013)

In this example, when two players are sharing information through the eyes, or one person is looking in and around another’s eyes, the information that is being shared may be more expressive or representative of an emotional connection. This information could either be related to the style of music that the group is playing, or it could signify a more personal level of meaning and be reflective of a person’s attitude or emotional state. Thus, as intuitive as facial expressions might seem, the ability to read those of co-performers is directly related to how well the performers know one another.

The groups that I interviewed had varying ranges of membership length. By this I mean all of the string quartets had been established as a group for a substantial amount of time, but some had a mix of new and old members, while others were composed entirely of members who had been together over a long period of time. In a general sense, ensembles seemed to rely more heavily on visual means of sharing and acquiring information when there were newer members in the group. Three participants talked about using vision to establish a “database” of the other players’ tendencies and habits in order to facilitate synchronization:

When you don’t all have so much experience, or you don’t have so much time playing together … it’s harder to guess what each person could do, or what that person’s [particular] palette is, or that person’s [unique] way of being [spontaneous] would be. So if we were to just go ahead and do that, it would be harder to catch, without that visual communication. (interview with Violin 1 String Quartet C, December, 2013)

Because this participant does not have a database of another player’s tendencies, it is harder for her to anticipate how and when that player will play. By how and when a player will play I refer to 1) his or her technique or relationship to the instrument 2) the player’s preferred musical style of playing and 3) in situations where the ensemble is engaged in spontaneous musical variations, the ways (timing, articulation, dynamics, vibrato, etc.) that the other player is spontaneous. In
order to compensate for this lack in musical familiarity, the above violinist uses vision as a means of becoming able to anticipate what that other musician will do in the moment. By doing this she is also developing knowledge about the other person’s musical inclinations.

The process of developing group cohesion via visual information sharing is evident in the fact that different groups also tend to develop certain technical tendencies, for instance, how much bow speed they use. For example, if a musician from one string quartet joins a different group, and that new group has a different tendency with their general use of bow speed, it will take time for that player to adjust and for this tendency to become ingrained. Vision is an important means of doing this:

One of the things I realized by joining another group so quickly is how differently my colleagues approach the string, and how quickly they can get from one spot in a bow to another, so I have a lot of watching to do in terms of beginning things together and breathing together. (interview with Cello String Quartet B, January, 2014)

In this case, visual feedback can serve as a good reminder that group members are either in or out of sync with each other and help them monitor what is happening in the group. Part of the ability to develop group cohesion—and thereby reduce the need for visual cueing—relies on visual cues that help ensemble members develop databases of each other’s tendencies as players that will ultimately take the pressure off vision and allow them to perform well together based more exclusively on sound, feel, and habit. The cellist from String Quartet D supports this idea when he says, “I feel as we’re getting more mature as a group, we use physical gesture less than we use musical gesture.”

Once members develop databases of tendencies, they are able to anticipate more easily how the various other members of the quartet will execute particular musical passages. This allows them to respond more quickly and more easily in the midst of performance. With the databases well-established, typically as a result of playing together for extended periods of time complemented by visual information gathering, visual communication becomes more oriented toward either reading expressive or emotional information from their colleagues or explicitly sending such messages.
5 Showing/Misunderstandings

After asking one interviewee if he used visual cues to infer information about the internal states of his co-performers he commented,

When I look up and look at people, a lot of times I’m trying to send and show ‘can we do this?’ [For example] we were trying to do something in the last movement of Schumann [String Quartet] last weekend and we were trying to get this sound, so we were saying ‘can we just get into this place and make it feel like it’s this warm bath and we are just sinking into it and that’s all we are thinking about.’ And then the timing, the way we got into it, the way we immersed into this thing, it was very much what we were trying to get in the end, in terms of texture of sound and colour. So that was verbal, but it was also once they knew what I was trying to communicate, I was communicating it. Because when you’re trying to sink into a warm bath, it can also be seen as I’m giving up, or I’m less committed, when actually we are coming up here, and then ahhhh, let’s do that together. That kind of thing, you know what I mean? I don’t know if I’m being clear, but sometimes what I’m doing when I’m looking up is sending as much information. (interview with Cello String Quartet C, February, 2014)

There are a few notable points that this participant makes. He speaks about one of his visual gestures being misinterpreted by the other members of the string quartet, where relaxation was confused with lack of commitment. Clarity and understanding of expressive intent between co-performers is an important issue. When receiving information visually, sometimes there are different ways that different players will interpret facial expressions and gestures. In this case verbal communication was used to clarify the emotional intent of the passage after the realization that there were different interpretations of the nonverbal communication. Such discrepancies point out how important it is to be able to read how other members of the group are reacting to what is being sent out. This quotation also illustrates that, if the reaction received does not match the information initially expressed, it is necessary to take the time to verbally clarify intents and perceptions. “So that was verbal, but it was also once they knew what I was trying to communicate, I was communicating it” (interview with Cello String Quartet C, February, 2014). During performance if everyone is clearly expressing the same character, emotion, or expression of the music when necessary, the group will sound much more connected and the effect of that character becomes much stronger.

In this situation “reading” other members of the group actually goes beyond McCaleb’s inference stage since the performer who instigated the communication is inferring how his co-
performers are interpreting his initial intended message.\textsuperscript{71} Briefly, McCaleb posits that through the use of embodied musical knowledge acquired over many years of experience playing a particular instrument and playing with the same players, performers are able to correctly infer their co-performers’ musical intentions. This is evident when performers are able to understand one another during the act of music making, rendering verbal communication unnecessary. However in the example discussed above, this performer is aware of his own intentions while also visually monitoring the expressive intentions of the other performers. He realizes, by looking up, that he is not receiving back from them a response that matches what he had intended and that is, therefore, incongruent with what he intended to give out. Although this participant did not discuss specifically what was happening in and around his colleagues’ faces and eyes, the emotional qualities of relaxation and enjoyment were explicitly communicated through his eyes while he was looking up. At the same time the information that he was inferring from his colleagues based on what he saw included their facial and eye expressions. Because this was during rehearsal, he spent time verbally clarifying his intentions to the other members of the group. Once he did this there was no more confusion and everyone was clear about the emotional meaning of the passage.

Another interesting point the above participant made was that the other group members’ visual indications of reception and, therefore, their actions, were necessary for the group to realize the actual experience of the intended feeling of this passage. Subsequently when I asked this participant to expand upon incoming and outgoing communication he commented,

\textit{When you ask is there a line where, is there two channels, I’m either receiving or sending, I don’t see it that way. Even as I’m speaking with you if you had a different energy I would probably calibrate mine to yours. Do you see what I’m saying? So I think that the channels are always open between receiving and sending.} (interview with Cello String Quartet C, February, 2014)

Clearly he does not delineate between incoming and outgoing information, a concept that some behavioural scientists call interactional synchrony. Keith Sawyer (2005) describes this state when he explains “[ensemble musicians] have to monitor the other performer’s actions at the same time that they continue their own performance, to be able to quickly hear or see what the

\textsuperscript{71} McCaleb, \textit{Embodied Knowledge in Ensemble Performance}, 100.
other performers are doing, and to be able to respond by altering their own unfolding, ongoing activity.” McCaleb uses this concept in the development of his theory of inter-reaction, as it stresses the importance of moment-to-moment collective interaction between musicians that is in a constant state of flux. This is a very important skill for chamber musicians, especially with respect to maintaining synchronization and balance between co-performers throughout performance. This aids in strengthening the collective interpretation and artistic intent of the group.

6 Direct Eye Contact

During the interviews, I came to understand direct eye contact as a special means of communication between players used only at particular times. Participants acknowledged becoming aware of looking at each other or attempting to make eye contact with another member in two specific contexts. First, it was used as a form of positive psychological confirmation and acknowledgement that two people were going to do something together:

… making sure that we have eye contact before a phrase to say, ‘ok yes I remember that we do kind of need to connect coming here so we’re on it, we got this.’ So a lot of it really is a confidence thing and sort of to give us the comfort, ‘oh yes I caught their eye there’ or ‘I know that in two measures we have something together and I know that they’re thinking about it so it’s ah ok, great it’s going to be fine.’ And so it is, even just like a quick glance at the right moment is enough body language to say ‘I got your back it’s cool, don’t worry about it.’ (interview with Violin 2 String Quartet C, February, 2014)

This participant is emphasizing affirmative visual connections between players, occurring at different points during music making: in preparation for playing together and (potentially) during the musical action. These kinds of interactions help to reinforce and maintain positive rapport between players. If this kind of signal is recognized positively, “a new state of psychological awareness can be achieved which allows the individual to become both highly task-focused and able to explore spontaneous thoughts and feelings in a creative manner.”


73 McCabe, Embodied Knowledge in Ensemble Performance, 99.

A participating string quartet demonstrates this form of affirmative eye contact in this excerpt from Haydn’s String Quartet Op. 33 No. 3 in bars 18-19 (see Figure 1, page 50) at the beginning of the first movement. In this example (see Video 1, page 50) the Cello and Violin 2 have a short accompanimental melodic figure together in the middle of bar 18. In this particular example the cellist initiates the form of positive eye contact. Violin 2 then responds to this look by looking back.

![Figure 1](https://example.com/figure1.png)

**Figure 1.** Haydn String Quartet Op. 33 No. 3 in C Major, 1st movement, bars 18-19.

A less affirmative use of eye contact mentioned by a different participant is when it is used to convey very specific information. Often this is to get someone’s attention and is commonly necessary when one group member feels that another is not “with it,” or “there.” Perhaps the other group member is distracted, tired, or focusing their attention on a different concern:
But then we’re not always looking at each other just for the sake of looking at each other because the purpose is to send the music out and project towards the audience I think. And when there’s a message not for the audience but for us, that’s when we really impose, can you see my face right now? I’m trying to tell you something you know. I mean you can start subtly but if you see that the person is not there, you can try but sometimes you don’t get the signals from the others, because you are focusing on some other aspect as it happens. Yeah, if somebody is trying to tell you something, sometimes you don’t get it, or you’re against it. And you don’t want to, you know. (interview with Violin 2 String Quartet A, January, 2014)

This type of direct eye contact and intentional facial signals from one member to another are a blunt indication of how that member perceives the focus or performance of another member. This is an important point because the success of the group often depends on how focused each individual member is throughout the performance, which can affect the kind of energy that they are giving to the group. Direct eye contact is very personal and is, therefore, one of the strongest or “loudest” types of communication. There is a level of urgency to this action. If it is necessary to get a colleague’s attention and pull them back into the piece or back into focus, a more subtle approach would not work as effectively. Ideally, then, such a drastic type of communication would rarely if ever be needed. However, this is only possible if all string quartet members continually monitor what is happening to make sure no issues are looming, encourage and challenge each other to reach peak performance, and do so with no errors. This is often dependent on each member maintaining focus and really being present. This is no small challenge, meaning that occasional eye contact used in this way is a necessary corrective. On the other hand, if the receiver does not see the necessity of the correction, intense eye contact can be a source of friction between members.

6.1 Looking Up

When and how players look up is often dependent on the musical material. If one member is playing the melody, sometimes they focus on creating the line of the phrase and the supportive players then look at him or her. One first violinist mentioned, “I’m trying to play with somebody and they have the tune, like let’s say that the viola has the tune, I’m really trying to just look at them more actively” (interview with Violin 1 String Quartet C, December, 2013). In this instance, this violinist is looking directly at the person playing the melody. However, when the supportive line is rhythmically very dense, or complicated, sometimes the musician with the
melody will look towards their accompanists, in order render it very accurately and in sync with the other lines. The same first violinist also commented on this instance,

I guess that’s another instance where I’m playing with them in my peripheral [vision] and really trying to keep track of them and the harmonies that they’re creating and the fact that they have those eighth notes and then that syncopated thing. But at the same time, I’m supposed to play the principal line that people are drawn to, so I’m trying to play out. (interview with Violín 1 String Quartet C, December, 2013)

In this example, the violinist uses her peripheral vision to look at the other player(s). The moments that musicians look up at each other, even peripherally, are dependent on the demands made in the musical score. Such visual and visible cues help musicians make subtle adjustments to one another, so that they play together.

When and how people look up are also dependent on decisions around leadership that have been made within the group. For example, if the members of the Cecilia String Quartet have agreed that I am to lead a certain passage, transition, or moment, I know and trust that the other three musicians will look up and watch me. In this case, I often will not look up, as I will be focused on playing precisely and expressing my musical intention both to my co-performers and the audience. This type of situation is visible in this short video clip of a string quartet (see Video 2, page 53) playing the last bar of the first movement of Webern’s *Five Movements for String Quartet* (see Figure 2, page 53). Note that it is apparent that Violin 1 is leading the final *pizzicato* chord that the group plays together. Violin 2, Viola, and Cello all look up at him, during their rests as a way to coordinate their *pizzicato* precisely.
In my experience, the specific times that string quartet musicians look up from the score are usually related to the musical material or decisions around leadership that have been agreed upon within the group. Deviations are also critical moments for looking up. During rehearsal and performance, patterns for executing musical passages become entrenched. In the past, when I noticed that a pattern had changed or been disrupted, sometimes I would directly glance up (usually quite quickly). Often this physical type of response was so fast that I was hardly aware of doing it. Subsequently, I have had to train myself not to do this during performance, especially if something unexpected happens. Indeed, looking up quickly can communicate that there is a problem to the audience as well as the members of the ensemble. Like direct eye contact, a sudden glance up from the score can be necessary, but it can also be unintentional and convey messages that cause problems.
7 Facial Expressions

When the matter of facial expressions came up during the interviews, some of the interviewees associated it with acting. This connotation was somewhat negative, as they did not want to be perceived as being false or putting on an act in any way. These participants suggested that they viewed facial expressions as conscious or intentional expressive devices that could be used to seem more emotionally involved with the music than they actually were. Thus it could be said that these musicians value musical expressions and related interactions that are genuine and not affected. Another possibility is they did not want overt facial expressions to supersede the sound experience either for their colleagues or the audience.

Facial expression differs from person to person: some are more spontaneous while others are more conscientious with how and what they express with their face. In the context of a musical ensemble, furthermore, using facial expressions to externalize musical experience does not necessarily affect fellow performers if for no other reason than the colleagues must see the expression. However, some players may look more often at a colleague’s face if that person happens to express a lot of musical or emotional information and it helps them feel the music accordingly. Also, some players will deliberately look at another musician’s face to confirm the emotions they are hearing during a musical passage. Typically a player performing a more supportive line will look towards the player that is playing the melodic line in order to accurately support the shaping and emotional quality of the phrase. One participant talked about doing this, noting that, “... the facial expressions are a confirmation that my guess is correct, but that comes after I’ve heard what is developing in the sound” (interview with Violin 2 String Quartet D, November, 2013).

The facial expressions of musicians during performance are often unintentional. Expressions may be contingent on the relative technical difficulty of a given passage and reflect the level of concentration it takes to execute it. Some players may automatically take on a more static facial expression when they are focused on a technical challenge. Others frown, forget to blink, or express tension in some other way. However, these reactions are equally if not more likely to be related to the execution of the music rather than its character or emotional content. Another example of a facial expression that is typically not fully intended is what I call a secret smile. I find that these occur for two different reasons. They might happen because there has been a
mistake made by one of the performers—in this instance, the smile can help relieve tension and is thus, quite different from a startled looking up. Or they can occur upon the completion, successful or not, of a passage or transition has been discussed in great detail during rehearsal. Part of the reason the secret smile might not be as disruptive or dramatic as looking up is that it does not command attention in the same way. That is, in many instances, they can be easily perceived and understood when seen only in peripheral vision and do not necessarily command a direct visual engagement. This points to the importance of peripheral vision in string quartet nonverbal communication.

8 Peripheral Vision

In the introduction to this thesis and again in this chapter, I have stated several times that peripheral vision is more crucial and useful in string quartet performance than direct eye contact. Indeed, most participants indicated that they did not rely heavily on looking each other in the eyes. However, they did talk about “sensing” or “feeling” in their efforts to play together. One participant mentioned the combination of seeing and “sensing” as a means of being sure about what his colleagues were doing, especially when hearing his colleagues proved to be difficult (interview with Viola String Quartet D, November, 2013). It is possible that this sensing happens through peripheral vision, a topic that six of the nineteen participants directly addressed in our discussions.

Of these six participants one first violinist noted the importance of using peripheral vision to maintain connection with the members of the quartet while projecting her sound out towards the audience,

But I think peripheral vision, as you know, is probably what I use most, because I think, also sitting where I sit, and I probably do have a tendency to turn in when I want to see. When I want to look at something my natural inclination is to turn that way but, I think that is not always super helpful, in terms of sound and trying to [project]. So I think peripheral vision is really important. (interview with Violin 1 String Quartet C, December, 2013)

Arnold Steinhardt, who also played first violin in the former Guarneri String Quartet, supports this claim,

God has given us peripheral vision. That’s enough for everything you need in a quartet. To actually look at John [the second violinist] I would have to turn my
back to the audience. I don’t have to see his expressions – inspiring as it may be – but I must be able to see his bow and, above all, the fingers of his left hand.\textsuperscript{75}

Peripheral vision allows musicians to keep their body facing one direction while being able to monitor what another player to their side is doing. Another instance musicians use peripheral vision is when they do not want to move, as one cellist pointed out, “where you physically don’t want to move too much because you want the passage to be still, so the only way to actually see the cue is to use your peripheral vision, so it looks a little funny, because everyone has their head down, and eyes looking up” (interview with Cello String Quartet E, October, 2013).

As discussed above, our eyes have the ability to gather information from a number of different places with varying degrees of acuity. Peripheral vision is key for musicians to visually monitor multiple events more or less simultaneously. However, as the idea of foregrounding and backgrounding suggests, it is not necessarily possible to focus on multiple events, for instance the moving fingers of two or more co-performers, at the same time and with equal attention to detail. It is, however, possible to use peripheral vision to see the music and general features of what another player is doing even while focused more directly on something else:

There’s so many things that have to start with such a matched feeling in the right hand, so peripherally, you can realize whether this person, because we are all looking at the score, and we play off the score, there were times when I realized, ‘oh this person isn’t quite ready,’ so I re-gauge my own preparation to make sure that we were preparing and then making noise at the same time. (interview with Cello String Quartet B, January 2014)

In this particular example the cellist is looking directly at her musical part while using her peripheral vision. Her peripheral vision is backgrounded in relation to the score but foregrounded with respect to, say, the musician on her other side, to stay in contact with the person that she is playing with. If a player has their music memorized and is therefore looking up towards the group, it would be possible to see the other three players nearly simultaneously by using peripheral vision. All of these different facets of vision help string quartet musicians stay connected to one another.

\textsuperscript{75} Blum, \textit{The Art of Quartet Playing}, 14.
9 Visual and Sonic Lines of Communication

The two first violinists that were quoted in the previous section mentioned that they used peripheral vision as a means of staying in contact with the other members of the group, especially the second violinists, while still being able to be in a position to project their sound out to the audience. This is also the case with whoever is sitting across from the first violin, also on the “outside,” as it helps the instrumentalist situated there (either the cellist or violist) to be slightly turned towards the audience.

It is generally hardest for string quartet musicians to see the musician(s) sitting directly next to them, as a turn of the head is necessary to do so. It is easiest for each musician to see the people who are sitting directly across from him or her. In the groups that I interviewed, there were two different configurations, where either the violist sat on the outside, or the cellist was placed on the outside, on the right hand side of the group (from the perspective of the audience). There are many different reasons that groups will choose either configuration, and string quartet musicians will argue strongly in favour of the configuration that they prefer. The seating debate focuses mainly on issues of sound projection for the viola and cello and also where the musical parts are physically located in relation to one another.

Those in favor of the cellist sitting on the outside argue that the sound of the cello also projects through the back of the instrument, and that, therefore, having it closer to the audience facilitates the cello’s audibility to them. According to those in favour of this configuration the audience is also better able to hear the viola when it is on the “inside” because it is possible for the F holes to face them, thus projecting sound in their direction. In this configuration the instruments are also lined up from highest to lowest voice. Musicians will argue that this helps the musical relationships of the first violinist and the cellist, and the second violinist and the violist. Specifically with the first violinist and cellist sitting directly across from one another and the second violinist and violist next to each other, both pairs are better able to coordinate their musical material—something they are frequently asked to do. As the highest and lowest voices the first violin and cello often have musical material that is interwoven and complementary, while the middle voices of the second violin and viola often have parallel musical material. In addition, when musical material is passed around the group from highest to lowest voice, or vice versa, it is passed around the semi-circle in order.
The arguments for sitting with the cellist inside are mostly the same, but applied to the other instrument. In this view, the cello is said to be able to project better from the inside with their F holes pointing towards the audience and the certainty of projection out the back of the viola emphasized. Thus, the violist sitting outside is now seen as preferable. Despite the fact that both arguments for positioning make the same opposite claims about which instrument, viola or cello, can be heard by the audience because of how its sound is projected, there are important sonic implications related to seating position. In the cello inside formation, the bass in the middle of the group helps ground the group around the lowest pitches played. Also, the violist is able to turn out towards the audience when necessary (aiding projection). Cellists, on the other hand, have more difficulty turning outwards from the outside position. Musicians also argue that it is beneficial for the first violinist-cellist and second violinist-violist pairings to connect over the sound of the group. These spatial pairings strengthen these musical connections, making the group more unified.

### 9.1 From the “Outside” Viola Position

When the viola is on the outside, which is the way that my group sits, it is easier for me to see the violins and more difficult to see the cellist. I have to turn my head or torso slightly to the right and thus away from the audience in order to see her. If I want to turn my viola towards the audience in order to project, my ability to stay in peripheral visual contact with the other members in my group can be compromised—a challenge I share with the first violin. Maintaining this visual connection without sacrificing projection to the audience is important enough to me that I have recently been thinking about developing the ability to readily turn my arm, shoulder and viola out towards the audience, while turning my neck and head towards my group when need be. This would enable me to stay in contact with my group and simultaneously project the sound of my viola out towards the audience.

In addition to the seating configuration of the string quartet, there is the matter of the actual distance between players. As noted earlier, spatial considerations affect the kinds of cues performers rely on to communicate with one another and on how musicians play their instruments. For example, in the study by Tovstiga et al. (2005), violist Wendy Champney of the Carmina String Quartet of Switzerland “has a rule of thumb which boils down to initiating an entry ‘10%’ too early, in order to compensate for the 2.5-metre distance separating players and
her viola’s characteristic (physical-technical) response-time lag.”

It is important to note that Champney sits on the inside, and this principle may even need to be increased for violists sitting on the outside, because they are situated even further away from the other players.

My string quartet often switches places during rehearsal to facilitate synchronization, especially when the cross-relationships (i.e., the first violinist-cellist and second violinist-violist pairings) are having trouble playing together. This can be quite illuminating because the sights and sounds experienced from a different chair vary considerably. As a violist I often share a lot of musical material with the second violin, and being right beside her enables me to hear what she is playing much more clearly, which makes it much easier to synchronize our ensemble. In this case, I rely less on visual means for incoming information.

When string quartet musicians are on stage, the only physical barriers between them are the music stands that are used to hold their musical parts. In order to see each other more clearly, many groups prefer to use lower, wire stands so that they are able to clearly see the upper torso of their colleagues. This type of stand also helps players to “sense” the physical movements of their colleagues, as there is not as solid a barrier between the players. As an even more extreme means of reducing physical barriers when performing, some string quartets play everything from memory. The most famous example is the Kolisch Quartet, who even performed Berg’s *Lyric Suite* (a famously complex piece) from memory. Another more recent example is the Chiara String Quartet. Even string quartets that do not play everything from memory will sometimes play extended passages, or even whole movements, from memory. Although these ensembles still have stands in front of them, memorization allows the members to look around as they choose or need to. If they do not actively look anywhere in particular, they are, further, more able to focus actively on the sound.

10 Relationship of Vision to Sound

Visual information is also important in its relationship to sound. When string quartets are performing, each player’s hearing and sight lines vary in relation to their positioning within the group. Depending on their position each musician will use cues from each channel of sensory information.

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reception in different ways to facilitate coordination of the ensemble. However, with sound being the ultimate goal, it is understandable that many participants commented on the importance of listening over looking. String quartet musicians are essentially dealing with the production and dissemination of sound:

I always like to think that great ensemble has more to do with how you are listening than how you are watching movements, but maybe I’m a little bit extreme in that end, I know there is quite a spectrum. (interview with Cello String Quartet B, January, 2014)

Another participant from the same string quartet agreed, noting that he found more importance on the “listening side of things than visual” (interview with Violin String Quartet B, January, 2014). Yet another participant commented that the effect of the sound has a more powerful impact on the group than that of any visual signal,

I know as a cellist I feel like I can almost always direct the group without any of that [physical gestures], that I can shape a note, or articulate something [and] push against somebody’s sound. And that steers the group in a way that something visual doesn’t really do. So I think there’s a balance between the two, but I feel as we’re getting more mature as a group, we use physical gesture less than we use musical gesture. (interview with Cello String Quartet D, November, 2013)

In this context, when the cellist mentions musical gesture he is talking about sound not bodily movement. He notes that the quartet relied more heavily on acquiring musical information through vision when their group had less experience playing with one another, but as this experience increased the group relies more and more on sonic information.

Interestingly the second violinist from the same quartet talked about sounds pushing against one another as well. He also talked about how his playing is led to a great degree through the sound, which is something not likely perceived by the audience,

I also get a lot of leadership just out of the sound of the player and how that sound is being used and how my sound is being taken in. And so, sometimes that gets us into trouble, because we are all kind of pushing sounds and if you’re not really connected on enough levels, they can shoot past each other, and that just causes issues. But in the best sense, when those sounds are in proportion to one another, then all of a sudden you’ve got something that can hang onto itself, and you can really feel that sound pushing and pulling you one way or another. You may not be able to understand or describe it, but it’s very much like somebody has grabbed a hold of you on both shoulders and is moving you this way or that way. And you have the ability to resist or switch that around, but it’s not something that is
necessarily visible to the audience. It’s more something that’s coming just through that sound. So I think you hear it, and when the group is doing it, you definitely know it but you may not be able to describe why that’s happening. (interview with Violin 2 String Quartet D, November, 2013)

This participant talks about sonic information actually influencing him in a physical way. When this sense of balance and connection between the different sound waves is achieved, it goes beyond any visual connection that can be made in that it holds a lot of continuous, ongoing musical information. Indeed, the sound is enveloping and therefore non-stop when the musicians are playing whereas visual cues are highly dependent on the position of the performers, when and where the player is choosing to look, and thus interrupted when a sight line is broken.

The first three participants quoted in this section talked about the relative use of vision and hearing as being on a scale or spectrum, implying that individuals and even groups may use them in different ways, and that the balance may shift between the two. The fourth participant, on the other hand, commented on the power of the sounds from the four musicians interacting with one another being in a realm different from that of visual communication. Participants seemed to be well aware of how much they think they are relying on either hearing or vision. In fact, if they felt that they were relying on one or the other too heavily they would often try to re-establish that balance, reminding themselves to use the other one. “I’m a very visual person, ok, so I’ve actually trained to be a little bit less, so sometimes I think just play, don’t look there” (interview with Viola String Quartet B, January, 2014). In general, there seems to be more concern if the players consider themselves to be relying on visual signals too heavily. Sound is ideally their primary focus and in most instances vision is used to facilitate it by confirming what is being heard or aiding coordination. However, hearing and vision work together in many different ways and shifts in focus happen according to whichever is most beneficial to any given player at any given time.

10.1 Absence of Sonic Information

I often rely on visual cues to play together with the violins, especially with the second violin. We are both inner voices, and often it is difficult for me to hear the second violinist as clearly as I hear the cello and to some extent the first violin. If I rely solely on auditory cues or information that I am receiving from the second violin, I will often play late or behind (much like violist Champney of the Carmina String Quartet). Fortunately from my position I can hear the cello
very well, so I tend to rely on aural cues from it, as the sound that I receive is very immediate. As a result, I listen more to the cello whereas I watch the movements of the violins (especially the second violin). This combination allows me to align my sound precisely with theirs. This suggests the use of what Fatone et al. (2011) call “cross-modal phenomena” in their article “Imagery, Melody and Gesture in Cross-Cultural Perspective.” Although they are not studying the use of such phenomena between co-performers, they investigate how auditory, motor, visual, and conceptual counterpoints “may be integrated, generating a unified meaningful action” and how this is also important for nonverbal communication between performers.\(^7\) Jakobson’s foregrounding and backgrounding adds a useful nuance to the arguments presented in Fatone and her colleagues’ work. Berger’s use of Jakobson suggests that perception (of gestures in the case of Fatone et al. and communication in my study) is not so much a unified process of different streams of information, but rather a practice in which perceivers switch between various sub-channels of sensory reception, paying more or less attention to them at various times as is necessary. For example, I may focus on peripherally seeing the movements of the second violin while attentively listening to the sound of the cello—a decision that is partly due to my position in the group. Furthermore, I may balance my focus between the visual and sonic channels of sensory reception depending on the musical material. If the musical material between the second violin and myself is very similar, I may add slightly more focus through the visual sense to really ensure that I am playing together with the second violin, and may even look more directly at her (switching the sub-channel within the sense that I am using). Thus while hearing, seeing, and other sensations do contribute to a whole multisensory experience, it is not unified to the degree that all sub-channels within the channels of sensory reception or even the channels of sensory reception themselves are experienced equally. Rather as the comments of the string quartet musicians suggest, there is an active process of switching or focusing attention based on individual needs and preferences during performance. Therefore, the ability to manage various streams of simultaneous nonverbal communication is an important skill for chamber musicians. The importance of this skill is raised further since both ingoing and outgoing information interacts and flows over the course of performance.

\(^7\) Fatone et al., “Imagery, Melody and Gesture in Cross-Cultural Perspective,” 203.
Interestingly, a violist who sits on the outside of his group also mentioned watching and sensing the violins and the cello because he was not able to hear the other players as much as would be ideal. Focusing predominantly on a visual approach in this context, then, provides this musician a very useful strategy for making a stronger connection to the other players regardless of his ability to hear them:

Because if you sit in the viola spot, off in the corner, most of what I hear, I don’t hear anything that anybody is doing most of the time, ever. Like I really, I really don’t hear the detail of what people are doing, and so I’m always looking and sensing, with other senses, like do they feel at this level of intention or level of intensity? Then it doesn’t matter if I can’t hear his change, or I can’t hear what the intention is. (interview with Viola String Quartet D, November, 2013)

Of course, these techniques are not only employed by violists who sit on the outside of string quartets, but also in many situations where auditory feedback is limited. This was shown in a study of duo pianists (Goebl and Palmer 2009) in an experiment where the availability of auditory feedback was controlled and in some cases reduced or completely absent. “Analysis of the cross-correlation of head movement acceleration time series indicated that visual cues were of greatest importance to coordination when auditory information was absent.” Sonic information can also be reduced in concert halls where the acoustics make it difficult for players to hear one another. Each member of the group builds up knowledge of which information is accessible visually to help facilitate sonic coordination.

One participant was unsure of the relative importance of audio over visual, but commented on the importance of “being in the zone,”

I’m not sure if it’s because you’re listening or looking, but if someone plays a note, a little bit longer than usual, unless you’re kind of tired, or you get distracted, or whatever, which is totally legitimate for anybody, but if you’re totally in the zone, and you notice someone doing that, that you can actually sense it while it’s happening. (interview with Violin 1 String Quartet E, October, 2013)

The concept of “being in the zone” is similar to Seddon and Biasutti’s (2009A) concept of musical attunement and also McCaleb’s attuning stage of inter-reaction. Seddon and Biasutti’s

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concept of musical attunement involves listening and responding to fellow musicians and the various modes of affective sensitivities that allow creative learning experiences to unfold.\textsuperscript{79} Empathetic levels of attunement are especially important as they deal more with challenge and risk-taking during creative musical interactions.\textsuperscript{80} For McCaleb attunement involves musicians applying their fellow musicians inferred musical intentions to their own unfolding performance.\textsuperscript{81} So being “in the zone” provides players with the ability to achieve a heightened degree of “sensing.” In this state it is possible to notice, either by listening or looking, that a player is engaged in “spontaneous musical variation.” The gap between anticipation and reaction becomes so small that group members are able execute spontaneous musical variation seemingly simultaneously.

Although being attuned to the sounds of the string quartet at any given moment heightens players’ ability to access valuable sonic information, vision can aid musicians at important junctures to achieve specific musical objectives. Visual signals can also be helpful and important when sonic information is compromised. An important part of this investigation is the way that performers shift between visual and aural cues, and their subsequent complementary use if not integration. Throughout this section, I have pulled them apart to investigate if there is an awareness of how and when each is being used, and the relative value of each sense in the context of music making. As indicated throughout this chapter, performers are often aware which channel of sensory reception is giving the most accurate information in any given situation. A more in-depth study on this topic, perhaps in the field of cognitive musicology, could be very enlightening.

11 Conclusion

Vision can be used in many ways and at various times in relation to the score and what is unfolding in a performance or rehearsal. When playing in a string quartet it is important to know how and when this information can be beneficial, for example, for coordination, expression, or

\textsuperscript{79} Seddon and Biasutti, “Modes of Communication Between Members of a String Quartet,” 118-19.
\textsuperscript{80} Ibid., 127-28.
\textsuperscript{81} McCabe, \textit{Embodied Knowledge in Ensemble Performance}, 100.
monitoring the performance. For more technical concerns it is possible to look at other players’ fingers, hands, and arms, or bow movements (a topic that will be addressed further in chapter 6). It is possible to get confirmation of emotional expression from facial expressions, when supporting a melodic line. However, the meaning of facial expressions is highly dependent on the musical context and the level of familiarity group members have with one another.

Vision is used as a basis from which to infer information from the other members of the group, and the eyes can be used to receive information and to send messages. Direct eye contact is used as an affirmative connection between members but also as a reminder to focus and stay attuned with the group. Peripheral vision helps diversify the amount of visual information that a player can take in at any given moment. This is helpful when a player does not have the music memorized, they do not want to turn away from the audience, they want to be physically still, or when they want to look at a number of players more or less simultaneously.

One interesting paradox is that groups seemed to use visual cues less as they became more familiar with one another, and yet the ability to “read” a fellow member increases with familiarity, allowing more specific kinds of information to be inferred. There are few potential reasons for this: 1) once string quartet musicians know what to expect they stop looking so much and/or they do not need to see as much in order to read, 2) sound begins to provide better information that is more directly connected to the most important goal of the group, and 3) in the beginning stages of playing together, visual cues are used for more functional or technical coordination, and once that is established and becomes expected, visual cues are used less often, but then they are actually used to interact on a more expressive or emotional level with group members.

Many people voiced their concern over the visual, or physical aspect of playing taking over the sonic parts of the experience. Mostly their emphasis seemed to be on how to balance these counter-parts, and whether or not movements that were seen were used in service of the music. Players were aware of how much they believed they relied on visual or sonic information to connect with the group, and again, would try to balance their use of the different channels of sensory reception and reasonably foreground or background the different sub-channels. One other important use of visual information is when players are unable to hear each other clearly.
This happens with instruments that are situated across the string quartet, or when the acoustic is aurally limiting in some way in a practice space or concert hall.
Chapter 5
Breath

1 Introduction

One aspect of nonverbal communication that surfaced repeatedly throughout the interviews was the use of breath and its importance in providing multiple layers of meaning, its relationship to anticipatory auditory imagery, and its role in initiating gestures and other kinds of body movement. Notably, I never prompted or encouraged the participants to talk about breath. Rather, ten out of nineteen of them addressed the topic of their own volition, thus suggesting its importance as a type of nonverbal communication.

By correlating the various ways participants discussed the role of breath in performance, it became apparent that it is used mainly for preparation to begin playing and cueing to start playing together during silence—a vital aspect of ensemble coordination. As string quartets are conductor-less groups, the responsibility to start, continue to play, and end together in a unified manner rests solely with the performers. Consequently, the preparatory communication that occurs before any musical sound is made is extremely important; the group needs to devise a collective approach to orienting itself. Cues are used for this purpose, and breath is a particularly effective means of cueing in this context.

The term cue is understood by the performers I spoke to as describing a very deliberate, conscientious signal consisting of some sort of body motion. Note that this is different from the more specific definition of cue developed by Brinner. Since the interviewees utilized a more general meaning of the term especially when discussing breath, I use it in this chapter to refer to timing information conveyed through bodily movements during some sort of silence. In these instances, the players actually take a breath in conjunction with the cue being given. As several noted, this breath can provide anticipatory clues into what each player is thinking, hearing, and even feeling. This was suggested by a violinist who noted that the breath “… can communicate

82 Brinner, Knowing Music, Making Music, 183-89.
things multi-dimensionally, and that it can embody all the things that you want” (interview with Violin 2 String Quartet E, October, 2013).

Some kind of cue is always used at the beginning of any given movement, when two or more people are playing together. Cues will also be used when at least two players must start playing together after some sort of rest, pause, or silence within a movement, as an indication to resume. These starting and restarting cues are typically clear to all performers and often audience members since they involve very obvious movements. Further, the breaths that precede them are often audible, but usually only to the performers.

The cues the study participants discussed are usually but not necessarily, combined with a breath. They also often involve the movement of the instrument and/or bow along with the body. Ideally in these instances the breath is taken either through the mouth or nose and initiates the body movement, preceding it very slightly. This may be barely perceptible to the outside observer, and it can appear that breath and body movement are made simultaneously. A faster intake of breath is usually associated with quicker body movements; and a slower intake of breath, with rounder body movements. The speed of body movements is typically relative to the breath speed, and then breath speed is relative to tempo. This was suggested by the cellist of String Quartet E, who said, “when I hear someone’s breath I’ll be aware of aspects about it, that hopefully I’m matching, you know like the loudness or the tempo of it, or the briskness” (interview with Cello String Quartet E, October, 2013).

Both musicians quoted above illustrate how a single breath has the potential to convey a fair amount of information within a very brief time span. Breath has the ability to communicate almost immediately the character and pulse of the music among co-performers. As will be discussed below, it also informs synchronization and sound production.

2 Character, Pulse, and Breath

Breath has the potential to embody and express certain qualities of emotional states that connect the performer’s interpretation of what is written in the score to what they intend to convey.

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Based on information gathered from the interviews and my own experience.
audibly. In this way, it is entangled with what I call the character of the piece, the “musical” expressions that are reflections of other realms of human experience shared and understood between composers, performers, and audiences. Robert Hatten (2004) talks about these linkages between human experience and music making to support his argument for a theory of gesture. I think this can also be applied to breath, in its universality, to be associated with particular modes of being: “… grounded in more general perceptual and cognitive competencies, [which] in turn support basic linkages between music and other human experience – connections that are essential for interpreting music’s expressive meanings.”84 Emerging from basic principles of human biology, string quartet musicians have a system of communication that links them to the character of what they intend to play. One participant notes, “if I were to play joyfully my cue, or our cue, or our breathing together was like [participant sniffs quickly and abruptly], it would be really hard to have it come out joyfully, so I think that what we’re thinking, what we’re hearing, and what is manifest in our bodies is all really connected” (interview with Violin 1 String Quartet C, December, 2013).

Breath is also used to orientate the musicians around the musical pulse. In Western art music different facets of timing are central to coordinating the rendering of the musical score. Tempo in particular can have dramatic implications on the emotional effects of any given composition.85 To initiate the start of a musical moment, breath can carry information about not only tempo, but also more importantly pulse. For clarification, tempo is a general indication of how quickly or slowly the music will go, whereas pulse is a peak within a pattern. Pulse is associated with musician’s internal representation of the beat and it has the ability to shift as players move through a phrase.86 The violist from String Quartet B gets at the idea of pulse when she talks about the essence of rhythm and how it connects to breath. She said,


86 Ibid., 32-33.
... to have a responsibility for the rhythm of the music and I don’t mean the beat of it, but the rhythm like the essence of it, so if you’re going to breathe it [participant sniffs in] like how are we going to breathe it, how are you going to cue it, for me I think that’s really important, [and] for my group. It’s just some sense of what kind of life you are going to breathe into the music. (interview with Viola String Quartet B, January, 2014)

This statement suggests that breath is a reflection of a musicians’ internal pulse. With this in mind, it follows that he or she would have an internal sense of the quality of the pulse before giving a cue. In this way, breath becomes the link between internal perception and the cue itself.

Connected to both of these elements, character and pulse, is the shape of the phrase that the musicians create together. The participants in the study noted that, in addition to the breath’s anticipatory role in preparing the individual instrumentalists to start and remain playing together, it also helps each player in the ensemble envision the shape of the sound they are about to create. This helps them further connect with their colleagues by confirming that everyone has similar intentions for the phrase. As the second violinist of String Quartet C said,

Actually we were working on breathing together today and how that changes the way that we interpret a phrase, just the actual breath before the upcoming phrase and how that actually has a pretty profound effect at least for us, profound effect on us, and what happens in the upcoming phrase. If we are really sort of breathing together and feeling it together we much more often get the same feeling throughout. (interview with Violin 2 String Quartet C, February, 2014)

As Keller and Appel (2010) investigated in their study, anticipatory auditory imagery is an important cognitive/motor skill for chamber musicians to have. Breathing together helps musicians communicate information about their own auditory imagery, while providing a means of synchronizing with the other musicians’ own auditory images. This breath allows musicians to feel the music together in order to move through the phrase in the same way.

3 Time of Reaction and Synchronization

So far the discussion has centred on how all four members of the string quartet breath together to facilitate synchronization. But what is happening when co-performers are still not together? There are two possibilities: 1) the intentions of the initiator may be unclear, or 2) there is some error of inference by the people who are reacting to the initiator. One participant said, “when a cue is not working, it’s because the idea is not clear in mind, the idea of the subject or the note,
something is not clear, so the time of reaction, when we don’t breathe with ourselves, we have nothing to communicate, it’s very hard” (interview with Violin 1 String Quartet A, January, 2014). The breath prepares both the initiators and responders, but there also has to be time during the breath for the initiator to receive the responses in order for everyone to play precisely together. A playful analogy that was used by one participant about breath synchronization involved swimming and the potential positive or negative impact that a preparatory breath can make. I imagine this analogy is also related to the kind of phrase that the ensemble would be playing:

So it’s more like a filling up your lungs at the same pace, so that everybody has the same energy into it. And also it’s like, suppose I have to swim or dive, and the person next to me is not telling me if we have to swim all the way to the other end of the pool, well I should be able to get it by the way that they give a swing and fill up their lungs, but if they jump spontaneously, whoops just like that, but don’t ask me because I didn’t have time to fill up my lungs or anything like that. So it’s the same kind of thing. That’s my image. (interview with Violin 2 String Quartet A, January, 2014)

In this example the analogy relates to the length of the phrase that the musicians need to play, which is directly related to the amount of time that is needed for all members to prepare to breathe and subsequently play the phrase as one unit.

4 Inhaling and Exhaling

The relationships between the cue during silence, breath, when exactly the musicians start to play, and the subsequent tempo is another important concern. When the breath is used to cue out of a silence, it would seem that both inhalation and the subsequent exhalation have to be accounted for. Yet, throughout the interviews, exhalation was mentioned only once:

… because you want to breathe together, you really want to breathe with that person, so you’re just kind of looking if that person is filling their lungs really big, or just doing an abrupt thing you know, huh, let’s go, or wheewwww uuu [big, long breath in and out], and if that person has the tendency to produce the sound while the exhale is happening or if they give a cue that’s more like a… [when] you have a cutting board, and the knife hits the board and you know exactly when, but sometimes if it’s something slow with a round sound but no attack, you breathe in [breathing in and out] and while exhaling you start the sound. (interview with Violin 2 String Quartet A, January, 2014)
In this case, the participant notes that each member within their group has a different way of interacting with their own breath. Such intimate knowledge is a byproduct of long-term membership in a string quartet. With time, the musicians can get to know each other’s idiosyncrasies even as they apply to seemingly “normal” activities such as breathing during performance. Yet such knowledge of when exactly each member is going to sound their instrument in relation to their breath is important for ensemble synchronization, as at some point, each member will be responsible for initiation of the breath in order to begin the musical passage. Nevertheless, the quote also suggests that exhalation might be less useful for cueing.

In general, inhalation is the preparation and exhalation is coincidental with sounding the instrument. There is a kind of tension and release going on in this interaction where the inhale feels like a preparation for the release as it sets up the expectation (tension) for sound, which is met (released) by playing the instrument. However, there are multiple possibilities for how the exhale of breath can be emitted. More importantly, it is harder to hear exhalation because at that point one or more musicians will be playing their instruments. In general, it appears that the rate of exhale would depend in part on how fast inhalation is—with a slower inhalation, both the exhalation and tempo would be slower in quality. However, there could be differences in the relationship between inhale and exhale rates. The exhale may be released over a longer period of time, or if a player is preoccupied there may be a longer delay before they release it.

In my experience, once the movement has begun, I am not aware of anyone consciously breathing at the beginning of each phrase. Normally intentional breathing happens at the very beginning of a movement, at key moments of challenging synchronization or emphasis, and then at various places where individuals or the group wants to take extra time or rubato. Individual breathing happens on a regular basis of course, but the purpose of this kind of breath is different. During performance, any small variations in cueing or breath intake (as well as other modes of nonverbal communication) have to be noticed immediately, incorporated, and reacted to in order to synchronize intentions and ensemble of the group. Because of the high demand for precision in string quartet ensemble playing, the combination of knowledge of these possible variations made either intentionally or unintentionally, need to be reacted to in the moment. Although I am sure it is possible, I have never witnessed a functional breath being misinterpreted as a cueing or communicative breath. Although the breath can initiate and communicate many things, it is less
likely to be confused as a different message because it is usually integrated with other aspects of playing and performance.

Just as there are different kinds of breathing taking place during a performance, breathing can also change depending on where the performers are within the piece or movement. As one participant noted, his and his colleague’s breathing was different once the movement had begun even if very similar musical material (including silence beforehand), to that of the very beginning, is being played again. He said,

... you know we found that starting in the middle once we’d already been rolling, that it was easier to do a quarter note cue than a half bar cue. I guess there’s no real rhythm or reason to that it’s just somehow once we’re already going bababum it’s easier than the opening. I suppose if you wanted to give a good reason for it than you could say the feeling is different so we have a different breathing pattern, different cue and that’s the reason, but really the reason is just ‘oh it feels better.’ (interview with Violin 2 String Quartet C, February, 2014)

This suggests the effect that an already established pulse has on the players and their use of breath. This particular participant also observed that even when the same material is repeated within a movement, because that material has gone through some sort of musical transformation, a different breathing pattern was used. In any case, these cues and breathing patterns were most likely explicitly established during rehearsal through trial and error, in an effort to synchronize the players.

Inhalation and exhalation can also affect the resulting sound that the players produce on their instruments. As a violinist told me, “… if the breathing is lower, the sound is much better I think, it’s much warmer” (interview with Violin 1 String Quartet A, January, 2014). This statement illustrates the physicality involved in playing an instrument and how connected it is with the body. Indeed, even the most mundane bodily function, not the least of which is breathing, can affect the sound a person produces from a musical instrument. McCaleb (2014) investigates the relationship between the performer and their instrument. He writes,

Recalling that the intention to create a certain musical effect alters the actions needed to physically produce that effect, musicians implicitly understand the dynamic relationship between their musical intentions (action-effect representations) and the processes needed to aurally reproduce the associated musical elements with their instruments.88

When playing in a string quartet, there are three people to remind the other (and vice versa) of these action-effect inter-dependencies. There are many different elements to manage at once when playing an instrument concurrently as three other people are playing. Players must be able to play and at the same time listen to all the different parts and understand how they are integrated with one another. As suggested, breathing and perceiving others’ breathing facilitates this.

5 Aural vs. Visual Utility of the Breath

While most of the musicians I interviewed discussed the importance of being attentive to ensemble mates’ breathing, two disagreed on the utility of hearing their co-performers breath. In the context of using the breath to facilitate playing together when they experience difficulties hearing instrumental sound in the hall, one participant observed,

Yeah, I know it’s strange, but in quartets, I feel like you can almost always hear breathing even if it’s really quiet, I don’t know why. It’s kind of like how whispering is really audible. (interview with Cello String Quartet E, October, 2013)

However, in contrast, another participant commented,

I would say I would be late if I relied on hearing the breath, right? And so, [I would say] it’s part of a bigger gesture, but it instigates the gesture. Maybe that’s more of it, but it’s something that’s more connected even more? Yeah. (interview with Viola String Quartet C, January, 2014)

It is possible that this participant was referring to the folly of following too much. This occurs when the performers are not actively engaged in moving and breathing together, resulting in those players being late in sound and feel to the initiator. However, it is also possible that individuals and groups use breath in very different ways. How individuals and groups use breath

88 McCabe, Embodied Knowledge in Ensemble Performance, 81.
would depend how individuals perceive breath helping him or her fulfill what they understand to be the group’s musical goals.

One participant pointed out seeing the body motion associated with breath in certain contexts,

> Because even when you breathe it’s like, there’s an upper body reaction that comes with it, and that’s visual, that you can see, even if you don’t hear the breath, but yeah, maybe the breath is so connected to body movement, and that’s why it initiates lots of body movements. (interview with Violin 2 String Quartet E, October, 2013)

When I asked another participant about using breath to determine the release of notes, the participant emphasized the visual aspects of breathing rather than the sound of the breath. This was after the participant commented on the importance of breath as a tool she used for nonverbal communication. She noted, “… the only way that you can see the breath is by the body motion I think, which I don’t know, some people may or may not attach to the physical motion of a release” (interview with Cello String Quartet B, January, 2014). This tactic would be used when musicians are playing because normally it would not be possible to hear the breath over the sounding note. There is an exception to this, if for instance a particular performer had a habit of loud breathing. In general the only way to connect to other members’ breath, while the instrument is sounding, would be visually. Other possibilities for realizing the ends of notes include sonic cues and the visual signals received by looking at the bow.

There are also different types of breath—those taken deeply; and others taken higher up in the body, from the chest. Breathing from the chest area affects the shoulders, as they will rise with the motion. It would be possible to see this motion. Breathing from the diaphragm (as singers are trained to do) will not affect the shoulders as much, if at all. This motion would be possible to see when looking at the mid-section of a colleague, if their clothing was tight enough. Musicians may also use a combination of these breathing techniques. These different types of breathing may also affect the quality of sound. Being able to hear and see breath while playing, provide valuable insights into the expressive, temporal, and timbral intentions of co-performers.

6 Conclusion

It might be surprising that so many string players talked about breath and its relative importance to preparation, character, pulse, synchronization, and even sound production, because it is not
actually necessary to breathe in order to make sound on string instruments. For many instruments (wind and brass for example) and voice, of course, it is a requirement to breathe before you are able to make a note sound. For these musicians the how, why, and when of taking a breath is addressed in great depth, and planned out in great detail when they are learning to play. In contrast I do not remember breath being addressed very much during my viola training. However, I recall two instances during my education when breath was discussed. First, I remember being instructed by my teacher to remember to breathe, right before going on stage for a high-pressure performance. This was to ensure that I did not hyperventilate on stage. The second instance occurred when a teacher recommended that I breathe noisily in and out when warming up by playing scales in order to achieve better sound quality (which was successful in my opinion). However, one participant did say, “I guess there are kind of standard things that people are taught in quartet, like you’re taught to breathe, and to kind of gesture like that, with your head” (interview with Violin 2 String Quartet E, October, 2013). While usually not explicitly taught, breathing nevertheless becomes a key element of unification and coordination for many professional string quartets even if members use it in different ways.

Throughout this chapter we have explored the many ways it is possible for breath to express intentions, and connect members within an ensemble. Although this may not seem to be an obvious choice for string players, the information that can be multi-dimensionally communicated through breath provides significant advantages for string quartet interaction. As in many other physical endeavors, such as athletics, yoga, and meditation, breath has the capacity to connect many different aspects of the mind and body.
Chapter 6
Towards an Understanding of Performance Gesture

1 Introduction

Throughout this chapter, the ways that string quartet musicians conceive of gesture and how it is used in string quartet playing will be explored. I am especially interested in what musicians want to accomplish through their use of gesture in its various forms over the course of a performance. At the outset, I will clarify some terminology used to describe related but different forms of bodily movement in musical performance, including sound gesture, physical gesture, technique, and body movement. Before parsing the distinctions between these categories, I begin by considering a few general ideas about gesture.

A conventional definition of gesture, found in the Merriam-Webster dictionary, is “a movement of the body or limbs (especially of the hands or the arms) that expresses or emphasizes an idea, sentiment, or attitude.” This can be movement of the hands, face, or other part of the body. Gesture analysis is used in many different fields including linguistics, anthropology, psychology, history, neuroscience, communication, art history, performance studies, computer science, theatre, dance, and of course music. Research on gesture has addressed a number of topics including face-to-face conversation, cultural and universal significance, workplace communication, media usage, child development, human evolution, and sign language. Many of these studies illustrate that gestures reinforce, modify, or negate the meaningful content of speech and that, importantly, they can also communicate information all on their own.

In contrast to gesture as it relates to everyday communication, musical gestures for performers are framed within the context of a musical language or style, which can extend beyond musical


sound. Research on such gestures links them intrinsically to the score, the types of movements’ musicians have to make to get their instrument to sound, or both. For example, music theorist and pianist Robert Hatten defines gesture as “significant energetic shaping through time.” Here he rightly offers “a definition general enough to include all forms of meaningful human movement” but one that still resonates with the unfolding of a musical performance. Even so, the majority of his study focuses on the notation indicated in the score and thus leaves out the kinds of non-notated, in the moment, and even improvised gestures that musicians use as they make music. Hatten was inspired to begin his investigation into gesture when his understanding and appreciation of music increased by watching and listening to a great performer bringing a notated score to life through his particular use of touch and body movement at the piano.

My interest in the ways that musicians communicate nonverbally with each other in performance takes this study beyond Hatten’s mostly hypothetical examination of notated musical gestures. Like Hatten, this study relates gesture to the directives of the score. However, the approach used here isolates and examines different gestures that string quartet players use to facilitate coordination, expression, and spontaneity between the four members during performance of the score. This is accomplished from analysis of the information derived from the interviews, analysis of video taken for this project, and by reflecting on my own experiences as a string quartet violist. The focus will be on body gestures, for example, those of the arms and hands, but will not consider facial gesture or expressions, which are discussed in detail in chapter 4.

As suggested above, music makers and music theorists use the term gesture in different ways. For example, two common uses of “gesture” are: 1) as physical actions involved in live performance, and 2) as a type of distinct, musical unit, that is usually short and defined by specific musical properties. Scholars and performers tend to use these two different conceptualizations interchangeably, which can become confusing because, based on my interviews, the first refers to the performer’s physical movements as guided by their interpretation of a work while the second emphasizes a more intellectual analysis of a work's structure that is not necessarily rooted in performance. Scholars have also analyzed gesture from a number of different academic perspectives—phenomenological, semiotic, theoretical, sonic,

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and physical. My primary interest lies with the physical and sonic gestures that facilitate the performers’ ability to communicate with one another and achieve their musical goals. This perspective is evident in the following comment made by one of the violinists in the study:

… while we are playing, we found that if we’re thinking of similar gesture even physically it really helps to be more together and more cohesive and unified. So ... if we’re trying to play something together and one person is ... moving, let’s say very simply in a downward ... heavy kind of way, which works for some music, and the other person is trying to lift and it’s a lot different physically, then sometimes it’s hard to get the same sound or the same feeling, or the same movement through the music, or through the sound. (interview with Violin 1 String Quartet C, December, 2013)

This statement resonates strongly with what I have seen observing the string quartet performances analyzed in this study, those I have seen simply for pleasure, and my own performance experiences. In sum, there are specific movements that chamber musicians use to communicate and interact with one another in specific ways and at specific times while they are performing a specific piece of music. Despite this particularity, however, there are communicative movements that translate across compositions within any one ensemble and at times between different ensembles as well.

This observation leads me to root my analysis in an understanding of gesture as musical interpretation embodied in physical action. This conceptualization provides the connection between a musician’s mental idea of a piece and how they technically and expressively realize it through their body. In some ways this will always vary from musician to musician because no two human bodies or minds are the same. However, there are some characteristics of gesture that are shared among musicians. Within a string quartet, musicians often develop their own gestural “dialect,” which encourages active listening and impacts synchronization and spontaneous musical variation during performances.

Gesture is inseparable from the flow of musical sound across time. As a musical piece unfolds, all expressive meaning and understanding created arise from the ways a performer interprets the score and makes its directives audible. This is realized through his or her physical motions. In addition, gestures represented by particular movements or non-movements of the musicians’ bodies are also part of the creation of the silences and stops that are part of the temporal space framed by a piece of music.
When I am in the audience listening and seeing a skilled musician performing, I am often able to immediately understand how very complex musical processes relate to one another as they unfold through time based on their gestures. In effect, they distill and give meaning to the structural and expressive elements of a piece of music. So if I hear a string or passage of notes, I am able to understand the relationship of one of them to another based on what I see in the performer’s gestures. This allows me to comprehend a number of musical aspects simultaneously. Robert Hatten relates a similar experience,

Recognizing that my playing was less than committed, my teacher [Menahem Pressler] sat down at the piano to demonstrate a more sympathetic approach. (1) It was a revelation I will never forget. Tears welled up at the poignancy and beauty of Schubert’s gestures, which I had completely overlooked in my reductive dismissal of its melodic and harmonic design. With a delicacy of touch, and a characteristic rubato that marked the accents and shaped the metre of this stylized Ländler, my teacher not only brought Schubert’s musical world to life, but captured an implied inner agency’s poignant evocation of lost innocence as well.93

In this sense gesture links the score, its conceptualization, and ultimately the effort necessary to make that imagining of the score’s instructions audible on an instrument. By linking these elements, gesture provides an understanding of those connections to the other musicians in the ensemble and the audience. This is particularly complicated in ensembles such as string quartets where members bring together different musical parts—and often initially different interpretations—with the ultimate goal of creating a unified interpretation of the score. Thus, in the following section, I discuss how and why gesture helps create various kinds of linkages in string quartet performances.

2 Sound or Physical Gesture?

Writing about gesture examines the relationship between sound and movement. Although they are related and influenced by one another, they can be analyzed from different perspectives that, in many instances privilege one or the other. During the interviews, a few participants asked me if I was interested in investigating musical gestures or physical gestures, and all of those making this distinction defined musical gesture in relation to sound and physical gesture in relation to the embodiment of the music as it pertains to the score. In an effort to tease out how these

93 Hatten, Interpreting Musical Gestures, Topics, and Tropes, 111.
performers understand and work through these distinctions in relation to nonverbal communication, three questions guide my discussion: 1) what role do physical gestures play in functionally and/or expressively coordinating members of a string quartet? 2) What role do sound gestures play in functionally and/or expressively coordinating members of a string quartet? And 3) what is the relationship between these kinds of gestures?

Because string players have to move in order to make their instruments sound, the connection between mind and body becomes an integral part of the creation and realization of sound. Many participants mentioned becoming increasingly aware of this relationship between physical gestures and sound gestures as they were learning to play their instrument, especially when trying to understand how their body helps or hinders musical expression. One interviewee noted,

> Because she [the teacher] was really into the body and how you’re either helping or not helping what’s coming out in the music through what you’re doing with your body… her big thing was making sure you’re as natural as possible and that you’re relaxed. [It’s important that] nothing is getting in the way in terms of tension - things like muscles - and just being aware of that. (interview with Violin 1 String Quartet C, December, 2013)

Clearly there is a direct relationship between what a musician does with his or her body and the sound he or she produces. When playing a string instrument, it is impossible to create sound without moving the body. But what exactly is the relationship between physical movements and sound gestures? Is it possible to isolate those physical gestures that produce sound gestures? Is it possible to identify physical gestures that do not produce sound? What about bigger and smaller physical gestures? Which physical gestures are part of nonverbal communication? Which gestures do musicians pay attention to? How do we differentiate between functional physical gestures and expressive physical gestures? Is it even necessary to do this? Hatten addresses this issue and elaborates on the different levels of significance for any gesture,

> Presumably, every technical movement a performer makes is already marked as relevant to the production of “significant” sound - hence, as artistic gesture. But, in fact, many movements observed in performance appear extraneous to the gestural interpretation of the music, and even among those movements that are expressively motivated, some may appear more significant than others.\(^\text{94}\)

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In this way, he adds more questions to those mentioned above: Which gestures will performers use to convey information (and what type of information) to their co-performers? When will they do this? Which gestures are for the audience? Throughout this chapter I will focus on investigating those gestures that performers use to communicate nonverbally with one another and the moments when it is important to do so.

Questions pertaining to how and why individual performers use gesture have been studied by a number of researchers. By viewing video of performances by renowned pianist Glenn Gould, Delalande (1988, 1990) proposed a typology of gestures. He distinguished between effective or sound-producing gestures that are physical movements that actually produce sound; accompanist gestures that refer to expressive body movements without direct impact on sound; and figurative gestures, which are understood as sound gestures but are made unseen (to the audience). While making these distinctions is an important starting point for clarifying the discussion on the meaning and use of gesture, in a study of string quartet performers, it is also important to note that, unlike an audience member, string quartet performers cannot look directly at each other throughout the performance. This means that they may rely more heavily on figurative gestures for constant synchronization. However, as discussed earlier in chapter 4, string quartet musicians use vision in a special way, typically relying on peripheral vision more than direct sight lines when they choose to look. Furthermore, because the performers sit in such close proximity to one another, their occasional use of direct sight lines makes them more able to see gestures that an audience member may not be able to. Clearly, though, these categories depend on the perspective of the observer. Additionally, the relationship or integration of effective and accompanist gestures is very important to string quartet musicians because of the importance placed on synchronization and unification. In fact, once again, the distinction between the two categories of gesture can be blurry. For example, consider a gesture involving the bow such as when and how it is released from the string. Note that when the bow is still on the string, and movement produces sound, it is an effective gesture. As soon as it comes off the string, however, any bow movement might easily be taken as an accompanist gesture. However, the distinction is not so clear since the shape of the gesture required to release the sounding note—the way that the bow follows through in the air—will affect the sound produced. This will be further explored in

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section 4.1.1 of this chapter, which focuses on an excerpt from Ravel String Quartet. Despite this ambiguity, for the purposes of this study I will differentiate when possible and useful between accompanist gestures, which I consider physical gesture; figurative gestures, which I consider to be exclusively sound producing; and effective gestures, which are a combination of accompanist and figurative gestures. When it is not possible to differentiate between effective and accompanist gestures, I will simply use the term physical gestures.

Other studies have engaged more closely with particular kinds of gestures, rather than trying to distinguish between them. Yet such focus depends on beginning with a definite definition of the gesture in question. For example, “Origins and Functions of Clarinettists’ Ancillary Gestures” by Wanderley and Vines (2006), went on to investigate the accompanist (or what they call ancillary) gestures used by individual performers, through quantitative analysis. The researchers were interested primarily in the production, repeatability, and patterns of ancillary gestures that performers make “that do not seem to have a well-defined purpose related to sound production, inter-performer, or symbolic performer-audience communication.”96 They found that three primary musical features influenced the performers’ expressive movements. These were: 1) material/physiological influences of playing the clarinet in order to perform the piece, 2) rhythmic/structural aspects as indicated by the score, and 3) interpretive choices developed by the performer based on the notation and the experience of performing it. They conclude that ancillary gestures used by clarinettists are not randomly produced “but that these gestures play an integral role in the performance process and mental representation of the music.”97

If indeed ancillary gestures represent a performer’s mental conception of these primary musical features, the ability to read ancillary gestures is an important part of understanding and subsequently being able to react to what is being communicated nonverbally within a string quartet. Of course, co-performers do not look at each other all the time, but when they choose to do so, ancillary gestures can provide insight into expressive choices made by each member. This would also help the group efficiently develop a unified mental representation of the piece of music based on this ability to understand each other and communicate effectively with one another.

97 Ibid., 185.
While Wanderley and Vines focused on gestural communication between one musician and his or her audience, a study by Williamon and Davidson (2002) explore it between musicians. Specifically they observe the continuous movements (hand lifts and swaying) of two student pianists as they prepare and play a performance. Like Wanderley and Vines, Williamon and Davidson also note that “certain movements were overtly explicit” and they add that some were “exaggerated.” They also found that these overt movements occurred at moments that were considered by the pianists to be “important for coordinating performance and communicating musical ideas.” However, it is important to note that these two pianists had never played together before participating in this study and that, as a result, their movements may have been overtly explicit and exaggerated as they attempted to get to know each other’s playing. Even so, the identification of moments in the score that are important for communication may have implications for string quartet players as well. While their movements may not be overt or exaggerated for nonverbal communication between the members, string quartet players may connect in more subtle ways, especially at particular (difficult, climatic, changing, etc.) moments in the score.

Existing research clearly points to the importance of gesture and its utility for understanding the meaning and use of movement, facilitating performance processes and the performer’s mental representation of music, and coordinating important moments in the score. One of the challenging aspects of playing in an ensemble is the coordination of these gestures, or the coordination of “performance processes and mental representation of the music.” Musicians that have played together over long periods of time will have significantly influenced the way that each member moves and uses gesture. Members are continuously interacting during performance, sending, receiving and reacting to messages through effective, accompanist, and figurative gestures, and through the other modes and channels of sensory reception that have been discussed in this dissertation. Each performer will be influenced by how their own part fits into the overall musical picture, and will be constantly making adjustments to their movement.

99 Ibid.
behaviour, depending on what they are playing, with whom and when. While it is important to differentiate the “kind” or “type” of gesture, when applicable, it is also important that the study of gesture include a holistic view of the way that different types of gesture are integrated into performance.

3 Range of Body Motions in String Quartet Musicians

In a discussion about gesture and body movement, it is important to consider the possible movements that string quartet musicians are able to make while they are playing. Most string quartet musicians, but not all, sit down when they play. Some string quartets do stand as they perform, but in this case the cellist remains seated and usually performs on a raised platform. The use of this platform suggests that visual contact between musicians might be important, and that using the platform might help the cellist see his or her co-performers. One other potential reason for the platform is to lessen the physical distance between the instruments in order to enhance the sound and, specifically, the blend of the group. Such blending is not, however, purely a sonic issue since being more level with one another also helps facilitate the coordination of bodily gestures by making movements easier to synchronize and imitate.

Whether a string quartet musician performs seated or standing affects how they move their bodies both in figurative and accompanist gestures. From the beginning stages of their training, cellists learn to play from a seated position. However, violinists and violists usually learn to play standing, a position that allows greater freedom of motion especially in the upper torso. Yet, as I mentioned, most violinists and violists working in string quartets perform sitting down, a shift away from the initial training they received.

One primary difference between standing and sitting is how the body is supported and how weight is distributed and balanced. When standing the weight is evenly distributed and balanced through foot positioning, pressure, and occasional movement. As a result, standing allows for

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“the necessary flexibility of the right arm [to be] be easily achieved through the pelvis.”

Standing also allows the body to sway back and forth when shifting weight between the two feet. The ability to bend the knees when standing provides violinists and violists a more buoyant relationship with gravity, which may affect preparatory movements. In contrast, the centre of gravity while in a seated position is on the *gluteus maximus*. This restricts the motion of the right shoulder and arm because the lower trunk is restricted to being nearly motionless. While possible, side to side swaying motion when seated is slightly more limited (both the fluidity and the amplitude) than when standing. However, it is easier to rotate or twist the upper body from the spine and also easier to lean forward and lean back in a seated position. Another difference is the ability to move the feet. It is possible to suspend the feet for longer periods of time while seated; while standing, people can take actual steps, but to suspend a foot would probably result in a loss of balance. In general the range of motion for the upper body, especially the bow arm, is restricted for violinists and violists while sitting. The bow arm movements and range of sway will therefore be smaller and less fluid.

While cellists have no choice—they have to play in a seated position—sitting for violinists and violists when performing in a string quartet is more a matter of tradition than necessity (although it can influence the blend of sound and, as I suggested, synchrony of movements). Because of the differing sizes of the instruments, the holding position varies and subsequently the freedom of motion that violinists and violists experience also differs from that of cellists. Cellists are free to move their heads, while violinists’ and violists’ head and neck movements are more restricted by the instrument that they are holding under their chin. This creates differences in ability to direct visual attention to the movements of other ensemble members as suggested by a cellist:

> The other thing I can do is actually swivel my head without affecting where my instrument is, so I can actually sort of be a little more focused on the individual members of the group while still maintaining a healthy playing position. (interview with Cello String Quartet D, November, 2013)

In this way cellists are able use direct lines of vision more frequently, if they choose to do so.

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102 C. Spahn et al. “Comparing Violinists’ Body Movements While Standing, Sitting, and Sitting Orientations to the Right or Left of a Music Stand,” 91.

103 Ibid.
On the other hand, the legs and feet of violinists and violists are less constrained than those of cellists since cellists rest or hold the instrument between their knees. While foot movement is best considered an accompanist gesture, lifting the feet or legs may reflect physical expressive information that a performer intends to embody in the sound. Although foot tapping may communicate rhythmic or timing information, it is actually disruptive to other members of the group in the context of string quartet performance. Furthermore, unencumbered by a large instrument pressing against them, violinists and violists, unlike cellists, are able to twist and rotate their torsos with greater ease. They can also sway side to side more easily than cellists but not quite as much as when they are standing. Violinists and violists are also able to lean forwards and backwards with greater ease. To be sure, cellists are also able to sway back and forth. Yet their rather large instrument must move with them, which can limit motion since a large shift in position can negatively alter playing position. For this same reason, it is more difficult for cellists to twist or rotate their torso or lean forwards or backwards.

The ability to move the upper body holds numerous implications for nonverbal communication as noted by scholars including Keller and Appel (2010), Davidson (2005), and Williamon and Davidson (2002). Davidson (2005) noticed swaying in individual piano performances, with the degree of movement increasing as the performer was asked to play more expressively. Williamon and Davidson (2002) found that swaying by members of a piano duet was relative to the overall tempo, and was also used to react to or generate rubato in the music. Keller and Appel (2010), who investigated anterior-posterior body sway in piano duos in relation to keystrokes, found that while the keystrokes of the leader were always ahead of the follower, the body sway of the leader was not always ahead of the follower. While they assumed that body sway was indicative of time-keeping and expressive playing/communication (two elements which they acknowledge are difficult to parse), they conclude that leader/follower relations in

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104 Based on my own education and experience in playing string quartets.
keystrokes were dissociated from leader/follower body sway motion. Notably for the two pianists, the amplitude of body sway increased when they could not see each other.

While I did not study body sway specifically in relation to different levels of expression, rubato, or timing of finger movements, I found that body sway and movements were closely integrated with the group’s interpretation of the score. In the video analyses I made of one group, the swaying motions of the violinists and violist were more circular in quality rather than strictly shifting from right to left. Typical motion included rotation of the torso mixed with swaying and leaning into and away from the group. With these motions, the quartet typically reflected musical elements such as phrase shape and the emphasis of a peak moment within larger phrase groupings. For example, they commonly moved more at peak moments or moments of emphasis throughout any given phrase, wherever that was notated within the phrase. Movements were also scaled to how large the phrase shapes or the peak moments were; with those at peak moments in the music being slightly larger than those following phrase shape. The quartet musicians also leaned in towards the group when the dynamic was louder or there was an increase in tension in the music. For example if there was increased tension in the tonality by raising up a tone, the violinists and violist leaned in towards the group while swaying. At the same time, the side-to-side swaying motion of the cellist increased. In this same videoed performance, a slight crouch in posture often reflected a softer dynamic. For example before a subito pianissimo everyone’s body position lowered to show that the sound that was coming next was going to be even quieter. Except for the beginning cue, which occurred during silence, these motions fit within the pulse that the group was playing. However, it did not seem to control or reflect the pulse. It appeared that these motions were more connected to the motion and shape of the passages that were being played. As such, these movements are productively understood as gestures since they reflect and reinforce the performers interpretation of the score and offer the possibility of communicating their translation of the score to other ensemble members and even members of the audience in an ongoing way.


108 Ibid., 41.
In contrast to the differences in their torso, head, and leg gesturing, cellists, violinists and violists, all share the fact that their hands come in direct contact with their instruments. The left hand works the fingerboard and the right hand manipulates the bow. Beyond many other considerations, smaller hand and arm movements have a fairly direct impact on the quality of sound production:

I think even though there’s so many different ways of playing the instrument, that it’s actually I think pretty limited to what you can do … [and] still produce correct sound, you know what I mean? So you can do something else crazy, it can actually hurt you because it can ruin what you’re trying to do, because you know, there are limited amount of ways to produce that kind of sound. (interview with Violin 1 String Quartet E, October, 2013)

While range of motion has been described so far in relation to the possibility of movement in different positions and between different instruments, there is a limit to how large individual players will want to make their movements. This is partly because the subtle movements of the fingers, hands, and arms play a critical role in the direct creation of sound. Because string quartet musicians sit in close proximity to one another, these smaller movements, gestures, and motions, which are largely invisible to the audience, can nevertheless be seen readily by ensemble members, albeit with some variation depending on exact seating position. Thus, members of a quartet can glean a good deal of information by seeing such sound-producing movements. Key here is that they “need to be aware of the amount of time it takes for a note to ‘speak’ on a particular instrument.”¹⁰⁹ This amount of time is governed by a number of factors, in particular the different string lengths and thicknesses among the three instruments of the ensemble. Violins have the shortest length and thinnest, violas are slightly longer and slightly thicker, and the cello’s string length is almost twice that of the viola and the cello also has the thickest strings. The longer and thicker the string is the more time it takes to speak. With this in mind, cellists and violists will often have to prepare their movements a bit ahead of time, while violinists may have to wait just a split second before they play. One cellist commented on this,

So sometimes, because she [the first violinist] has a thinner string, shorter string, takes mine longer to speak, she’ll cue me, but the reality is she’s actually

watching me too. She doesn’t play before she sees I’m ready. (interview with Cello String Quartet C, February 2014)

This type of awareness is a kind of competence that resonates with what Brinner calls “passive knowledge.”\(^{110}\) Passive knowledge “enables a person to understand and respond to something without being capable of producing it.”\(^{111}\) String quartet members need to know about the characteristics of the other instruments in the group. This knowledge can help them achieve tighter ensemble. It can also help each member decide how to move in order to compensate. Such compensation typically involves the finer motor activities of both hands. However, because the whole body is connected, knowledge about the instruments varied morphological and related functional differences may also impact timing of larger physical motions. Thus, the different characteristics of the three instruments will affect the ability of these instrumentalists to match movements and gestures.

Playing an instrument involves both larger and smaller body parts and muscle groups. Each particular instrument limits what each player is able to do with regard to the range and expressivity of motion used for communicative purposes. Whether a string quartet stands or sits will create different bodily challenges and possibilities for each member in the group. In particular, it can affect the use of the torso for violinists and violists, and determines whether swaying, leaning, or circular motions will be used (while seated), or if these larger gestures will be made through the whole body (while standing), making the movements different. Additionally, smaller movements made by the arms, hands, and fingers will also have a considerable impact on the sound that is produced. A study of body motion and gesture must therefore be related to many different aspects of playing, an awareness of the motions possible to make, and also a consideration of when the body is still.

4 Conceptualizing Technique and Gesture

So far, I have considered gesture from several perspectives, which include the performer’s mental conception of the score as embodied through their instrument; the relationship between


\(^{111}\) Ibid.
effective, accompanist, and figurative gestures; and then as body movements large and small that particular instrumentalists are able to make. In this section, I relate gesture to technique, which includes string players training their body so they can automatically manipulate their instrument to be able to create shapes or “energetic shaping through time” as they interpret notation from the score.\(^\text{112}\) I also examine some of the more technical or mechanical movements which players have to employ to execute their interpretation of the musical score.

When do functional effective gestures fuse with expressive effective and accompanist gestures in string playing? Put differently and in a manner more meaningful to string players: how can technique be conceived in relation to gesture? This question was discussed in four of the interviews. Before analyzing what was discussed, however, it is important to clarify and illustrate the definition of technique in the context of string playing.

The education of many string players focuses on developing “good technique.” Technique in this sense involves being able to physically manipulate the instrument and precisely execute most or all of what is notated in a score (or be able to “fake it” convincingly). Developing good technique makes it possible for a musician to perform difficult musical passages with seeming ease. Good technique also allows a player to control their sound production in terms of tone and intonation. It makes it possible for them to play very fast and very slow tempos and phrases. It enables string players to perform double stops and chords, have different speeds and kinds of vibrato, and to precisely coordinate their bowings and fingerings to create finely nuanced articulations on the instrument. It also involves training the body to be able to perform these actions in an almost automatic way.\(^\text{113}\) Despite the importance of technique, however, many musicians feel that, ideally, it should not be divorced from artistry. Rather, one of my participants, a violinist, referred to technique as “a vehicle to get to a step where you can express the music” (interview with Violin 1 String Quartet E, October, 2013).

Next it is important to clarify and illustrate again what I mean by gesture in the context of string quartet performance. This will serve to distinguish my conceptualization of gesture as implicated

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\(^\text{112}\) Hatten, *Interpreting Musical Gestures, Topics, and Tropes*, 95.

\(^\text{113}\) Brinner 1995 and Sudnow 1978 both discuss this in various ways.
in nonverbal communication from technique. Notably, several participants alluded to this distinction themselves, often in the form of a perceived opposition between technique and artistry. As I will suggest, however, my conceptualization of gesture helps bring these two notions, which are commonly opposed, together. Through gesture it is possible to integrate those motions needed to physically manipulate the instrument with those that express the musicians’ artistic interpretation of the piece. In this sense, technique combined with gesture gives musicians powerful tools to convey their personal feelings of artistry and understanding of the score through different kinds of movement. Through these means, string quartet musicians are able to execute their part of the score precisely, in addition to communicating nonverbally with one another during performance.

During the interviews, two negative concerns were expressed about technique. One participant observed that too many technical calculations could overload a player’s brain with information. This can negate or destroy the creation of an effect or gesture in music:

If the violist has a subito piano there, it’s still nice to feel that that gesture helps us to make it feel really like a natural gesture, where we don’t have to think, ‘ok we have to crescendo to about 70% and keep it at 2/3 of the bow and then change the bow speed all of a sudden.’ [That’s] too much mechanics to think about, whereas if you say ‘oh ok they are making this motion, this sound kind of goes with that motion,’ and that makes all of those, I don’t know, five hundred calculations that you make inside of your head to get a good sound for that particular character, [but then] it all sort of becomes one thing where ‘oh that’s the character.’ So it’s also for things that are planned and aren’t surprises and are not necessarily spontaneous but just sort of maintaining the right character. (interview with Violin 2 String Quartet C, February, 2014)

Ideally many of the subsidiary movements that make up a larger musical gesture are relatively automatic and not based on a series of calculations. The gesture of making sudden dynamic changes during performance that this second violinist is referring to is ideally complete in nature, containing information about many different aspects of timing, character, expressivity, and execution. Co-performers can read and respond to this information in order to understand different aspects of each other’s interpretations and actions.
This idea resonates with McCaleb’s discussion about how humans execute intended actions and what he calls the “ideomotor principle” or “backward conditioning.”\textsuperscript{114} Drawing on the branch of cognitive research dealing with “action effects,” this principle for McCaleb involves the knowledge of the motor skills necessary to achieve an action being based on the causal relationship between the intentional action and its effects rather than a series of calculations.\textsuperscript{115} McCaleb uses the example of children throwing a ball to illustrate how the human motor system is able to deal with movements as generalized yet specific actions, and “not on the kinematic detail of how we achieve [them].”\textsuperscript{116} In this conceptualization, the movements that the kids use to throw the ball should not be considered gestures—they are more productively understood as actions. On the other hand, if for instance, a child is angry and they throw the ball with aggressive intent, this lines up more closely with the idea of gesture as action that is entangled with emotional meaning. Relating this analogy to musical examples, throwing and making sound (technique) are considered actions, whereas throwing to convey anger and playing or shaping the sound to convey meaning are equivalent to a gestural action and musical gestures. Furthermore, these ideas can be related to musical gesture and technique through the understanding that technique is refined through “backward conditioning” (and not through a series of calculations) and is therefore more easily incorporated into executing gesture.

Ideally technique, gesture, and artistry would be combined in perfect harmony during the creation of music. In some compositions, this is easy enough to accomplish. However, in other instances, for example, when the composer either does not have a good understanding of the practicalities of string playing or does not take them into consideration, movements which are necessary to make music on a string instrument, where performers are using technique as a vehicle toward artistry, is much more difficult to accomplish. This is the case, if, for example, the technical motions required to execute the directives in the score impede expressive-effective gestures that the players want to make. Any hindering of gesture, further, holds implications

\textsuperscript{114} McCaleb, \textit{Embodied Knowledge in Ensemble Performance}, 67.

\textsuperscript{115} Ibid., 66.

\textsuperscript{116} Ibid., 68.
beyond the individual musician and instead, for the group, ultimately affects nonverbal communication.

4.1  Technique/Artistry Challenges in a Ravel String Quartet Movement

One example of preparatory technical movements getting in the way of an expressive-effective gesture and thereby creating challenges for the members of the Cecilia String Quartet is in the first five bars of the 4th movement of the Ravel String Quartet in F Major. In this case, there are bow placement problems for all ensemble members that make it difficult to create a dramatic realization of the score while playing in a totally synchronized manner and at the same time adhering to the score. The score directs the whole group to play five very fast doubled eighth notes (essentially an eighth note that is made up of two sixteenth notes of the same pitch) followed by a hold and release of a half-diminished G chord (indicated by a dotted quarter note with fermata). All of this is to be performed in a very loud dynamic. Then, following a quarter note rest (observe this is without a fermata), this two bar figure is repeated, except ending on a slightly different chord (Eb\(^{4/3}\) chord) in the fourth bar.

![Figure 3. Ravel String Quartet in F Major, 4th movement, bars 1-4.](image)

The difficulty of the passage occurs at the release of the fermata chord, which, if done in a dramatic way, leaves the players finishing at the upper half of their bows and out away from the instrument. At the fast tempo of the piece, there is very little time to get back to the lower half of the bow where the doubled eighth notes are played. In order to compensate, some players circle
back to the frog of the bow at the end of the release of the chord to be in the correct place to play the doubled eighth notes. However, a preferable way of executing the gesture—the held and released chord—would be to keep the bow out and away from the instrument, as it looks dramatic for all four players to be paused in such a position for a split second. As stated above, this makes it very difficult to get back to the string in time to start the repetition of the phrase with precision. This is not, however, simply a matter of visual effect. Rather, as implied by the notion of gesture as the meeting of technique, the demands of the score, and its artistic interpretation, it has important implications for the sound of the music, especially at the end of the chord. Rounding back to the frog immediately yields a more rounded smooth, complete, full, resonant sound. In contrast, keeping the bow out and away from the instrument can help the chord have a clearer, bolder, more sudden end.

There are several possible solutions to this challenge, all of which involve a certain amount of compromise. The players can leave their bows out and away from the instrument preserving the clear end of the chord and visual drama but taking a longer amount of time to get back to the frog and effectively extending the quarter note rest. Or they might choose to round back to the frog after the release, sacrificing the dramatic flourish of the release, both sonically and visually. Alternatively, drawing the bow more slowly across the strings during the chord is another option, albeit one that, compromises the exciting quality of sound. Yet this allows the players to get back to the frog on time for the third bar. Or they can play the doubled notes closer to the tip (i.e., higher in the bow), which keeps the quarter note rest in tact but may compromise the quality of articulation. Issues such as these challenge string quartet players to find ways to make these elements, expressive interpretation and execution of technique, work together. In such musical situations, where all members of the group are playing the same rhythmic figures, the communication between members is about achieving a unified interpretation and precise sonic synchronization throughout the passage. During performance these subtle nonverbal communications are reflected in the slight physical adjustments and reactions that each person makes to match the others, from the information that is flowing around them.

The above discussion points to the inter-relatedness of technique and gesture while also suggesting slight distinctions. The way the score is written also has a substantial effect on this relationship. Different performers have different attitudes towards the score, but in general all of the musicians I spoke with analyze it in great detail in order to try to realize the intentions of the
composer. At times it is easier to execute the directives of the score with the desired artistry—where technique and gesture are easily combined. In other instances musicians have to come up with creative ways of solving the challenges that arise between artistry and technique. Careful attention to gesture can be a powerful means of doing so.

To clarify, perhaps it is productive to think of technique as it relates to training the body and an analysis of the different physical motions it takes to execute the music, much of which becomes second nature to and even partially definitive of accomplished musicians. On the other hand, gesture can be thought of as including an individual musician’s explicit intention to combine their physical movements (which can be reflexive) with their creative mental conception of their musical part. Depending on the nature of the score, sometimes deliberation and creative problem solving are needed in order to combine physical movements with the desired mental conception of the music. When this has been done, nonverbal communication is channelled through gesture, and is used to help unify the group’s interpretation, as a clearer understanding between players makes the group interpretation stronger.

5 Cueing: The Practiced Gesture

Here I examine those gestures that are used before a musical sound to facilitate the physical execution of the musical score: cues. Cues and cueing are an example of how string quartet musicians use specific physical gestures in order to begin together and help coordinate their musical interpretation of the score, particularly with respect to tempo and character. String quartet musicians refer to the term cue in a variety of ways. Predominantly, when they say to “cue” they are referring to the movement that all four people make at the beginning of a piece, movement, or after some kind of pause or rest in the music (usually but not always when the pulse of the music has stopped) to start playing together. However, sometimes cues will be used in the continuity of performing a passage to help coordinate players around significant moments in the score where it is important to be exactly together. Other instances when these cues are valuable are when rhythms are complicated and players need to confirm that they are all in the same place or, in some instances, re-establish that coordination.

In Brinner’s (1995) analysis of interactive devices used by musicians in ensemble performance, he refers to the kind of cues string quartet musicians use after some kind of silence as “signals,” as they are confirming a course of action already known rather than indicating an unknown
He considers the kind of smaller cues that string quartet musicians use to coordinate while playing “markers.” However, among the string quartet performers I interviewed, cues made during silence are not distinguished from other kinds of coordinating gestures: they are all referred to as cues. In light of this, but with consideration to Brinner’s attention to different types of interactive movements, I will distinguish between two different types of communicative (“cueing”) motion throughout this chapter. First, there are gestures that are made during silence, either at the beginning of a piece or movement or after a pause in the music, to indicate that (and when) everyone should begin to play. I will refer to these as “cues during silence.” Second, there are motions that string quartet members use to help coordinate different aspects of the score while playing. Even though string quartet musicians refer to these movements as cues as well, for the sake of clarity I will refer to them as “signals,” which can be given slightly in advance or to mark an event as it occurs (a definition that varies from Brinner’s definition of signals). I will refer to completely unexpected messages as cues, with no mention of silence or any other qualification. Even though such cues, cues during silence, and signals have, in general, been planned and rehearsed, there are still variables that can arise during performance. These variables can potentially lead to interchanges based in empathetic creativity, which create musical atmospheres charged with engagement and excitement for the performers and audience members.

A cue during silence can be thought of as a special type of gesture. It is generally a short expressive movement used to signal players to begin to play either from the beginning of the piece or movement, or after a pause or rest in the piece where there is silence. Temporal, expressive, and emotional information can be communicated in the short time that any kind of cue takes place. As was discussed in chapter 5, breath is a significant means by which string quartet musicians might communicate such information at various points in a performance. The breath is particularly effective as a cue during silence. Indeed, several participants mentioned this. These cues during silence, including those related to breath but also those made with the


\[118\] Ibid., 190.

\[119\] Ibid.
head, torso, arms, etc., can be sharp or indistinct, angular or round, abrupt or broad to indicate the character of the music. They can also occur at different speeds, from very fast to very slow, in order to indicate the tempo of the music. They can be more vertical or more horizontal, sending information about the quality of the metre and pulse. They also embody the metre of the music, which will usually be either in two or three, or some variation of either metre. They can be large or small which is usually related to the dynamic of the music. Like other gestures, cues during silence operate in a variety of ways. Some of these might be quite obvious, others arbitrary, others counterintuitive. Some might be consistent across groups while others might be very particular. Signals can hold much of the same information but are used during more continuous passages as the musicians are playing.

Another concern for string quartet players is the importance, when necessary, of matching cueing and signalling gestures. When players are able to imitate or embody each other’s gestures it helps facilitate unification of sonic and visual musical material and intentions. Violin 1 of String Quartet C alludes to the benefit of doing this when she says, “… while we are playing, we found that if we’re thinking of similar gesture even physically it really helps to be more together and more cohesive and unified” (interview with Violin 1 String Quartet C, December, 2013). The cellist from String Quartet E also notes the importance of doing this but recognizes that she matches her colleagues with her own physical style, “But I would still say for the most part that my gestures are matched, they are my own version, but they’re in the same rhythm and communicate the same shapes” (interview with Cello String Quartet E, October, 2013).

In addition to breath and movement of various body parts, one participant commented on the important role the bow has in creating a cueing gesture. This is true of cues during silence and also signals. She mentioned this two times at different points, in the same interview. The first time she stated that, “the bow is a lot about gesture, and about cueing and just breathing; how to show things.” She then added that cueing is about “how you move with [the bow], and to me part of that is breath, part of that is how you work with the bow, the bow is sort of a stick of a conductor in a way you know, the scroll can also be thought that way too (interview with Viola String Quartet B, January, 2014). Included in the second comment is how the bow and instrument (for violinists and violists) become integrated with breath and movement to create the gesture of a cue. For instance, a simple cue during silence made by violinists and violists involves an inhalation that is coordinated with the upward movement of the violin or viola,
usually from the scroll, synchronized with an upward movement of the bow, which would be placed in close proximity to the string of the instrument. The instrument and bow would then come down again, returning roughly to their place of origin and signalling the beginning of the note. There may also be a bit of head or shoulder movement, and it may be possible to see the slight expansion and contraction of the rib cage. Besides the larger motions involved in giving cues during silence, the finer details of exactly when and how the sound starts have to be congruent within the larger cue. Having the bow close to the string is a preparatory technique used by string players so that they will be ready to put the bow on the string and pull the sound from the instrument at the exact moment they intend to. It is important for group synchronization that the onset of the sound comes at precisely the moment that is expected based on the outgoing information of the cue. For cellists this cue is a bit different, however, because of how the instrument is held. The cue will involve an up and down motion combined with a breath, but this is shown more in the head, the bow arm, and the bow as the cello itself stays on the floor resting on the end pin. It is also possible to cue using the exact opposite motions as were just described; first the instrument and bow go down and then up again.

There are many variations in quality and kinds of motions and breath that accompany cues used during silence. Additionally, the small physical variations of smaller body movements in the fingers, wrists, and arms will impact the sonic outcome, by varying how the bow and the instrument are manipulated. I have just described the basic principles of the most rudimentary type of cue. Cues during silence provide an opportunity for co-performers to coordinate their actions and breath before any kind of sound is made.

5.1 Examples of Cues During Silence

In the paragraphs that follow I will analyze two different examples of how cues during silence are used to coordinate string quartet musicians playing different pieces during performance. In the first example (see Video 3, page 100), Violin 1 gives a full bar cue with a circular motion of her upper body to initiate the first movement of Haydn’s String Quartet Op. 20 No. 4 in D Major, which is in 3/4 (see Figure 4, page 100). This motion also moves her violin up and down from a neutral (middle) position and back. After bringing the bow into close proximity with the string as she begins the movement of the cue, her right arm stays with the motion of the violin. This cue during silence lasts the length of three quarter notes all in one breath. The violinist uses a smaller
subdivision of circular upper body and right arm motion on the third beat to ensure that the group will really start together. For the whole first bar in this movement, the quartet all plays the same note, D, in different octaves, in a piano dynamic. The score indicates three quarter notes with staccato markings all under a slur.

When I slowed the video down to analyze how each of the members embody—reacted to and in a sense joined—the starting cue, I noticed that the violist and cellist made the same movement as Violin 1. Violin 1 made the largest movements, and the violist makes moderately smaller movements. The cellist made the smallest movement in this particular case, which she mostly did with her bow arm. Violin 2, on the other hand, did not move with the initial impulse of the cue made by Violin 1. In this particular example, Violin 2 ended up reacting to the motion of the cue as soon as the sound began, moving her upper body simultaneously with Violin 1. Even though the group all carried out the cueing gesture differently, the onset of the beginning note began at the same time (which could be easily argued as the most important aspect).

![Sheet music image](image)

Figure 4. Haydn String Quartet Op. 20 No. 4 in D Major, 1st movement, bars 1-2.

![Image of quartet](image)

Video 3. Cue  [https://youtu.be/zfX9eYukTOI](https://youtu.be/zfX9eYukTOI)
In the second example (see Video 4, page 102), to cue the beginning of the first movement of Beethoven Op. 59 No. 2, which is in 6/8, Violin 1 gives a large half bar cue with vertical motions of her upper body and violin. At the very beginning of the cue she leans in and down from her neutral starting position. From there she moves upward and back down again, to the original neutral starting position. At that point she pauses ever so slightly and then, continuing down past that neutral position, she plays the first strong *forte* chord that Beethoven has written. As she begins the motion of the cue, her bow arm is about a foot away from the strings. At the very top of the cue, her bow comes much closer to the strings, almost in contact with them. However, she does not place her bow on the string until a moment before she plays (at the bottom of the downward motion). For the whole first bar of this piece all members of the group play two quarter note chords, each followed by an eighth note rest (I – V\(^6\)). The two violins have three note chords on the very first of these chords (see Figure 5, page 102).

When I slowed down the video footage to analyze how each member of the group reacted to the starting cue, I noted that the cellist makes similar motions to Violin 1 with his head, although slightly angled to the left side and then coming down to the right side (instead of exactly up and down). His head then swoops even further down after the slight pause that Violin 1 makes mid-cue, at which point he starts to play. His bow arm makes a movement similar to his head, except smaller. His bow is placed on the string and pulled horizontally across from the moment his head is in its furthest downward position. The movements of Violin 2 were very similar to those of Violin 1, except not as exaggerated. Additionally her bow placement at the top of the cueing motion was slightly behind that of the first violinist. Her left forearm actually started moving slightly before Violin 1 at the bottom of the cueing gesture but the peak of the upward motion with her forearm was behind that of Violin 1. The movements of Viola were the smallest of the four players. His bow arm moved first, rising up above his strings, just slightly ahead of the highest point of Violin 1’s cue. He did not move until that point in the cue. After his bow arm moved, he leaned in slightly toward the group, but the motion of his bow arm was the only part of his body that moved significantly. However, even though all members of the group embodied the cue during silence in slightly differently ways, the onset of the chords began together.
From these examples we understand that the gesture of the cue during silence helps group members coordinate around differences in musical style such as, character, speed or tempo, spatial orientations, metre, and dynamics. The cue that starts the Beethoven is sharper and more angular than that for the Haydn because the character of the music is more aggressive and upright. The speed of the cue for the Beethoven is also much quicker because the tempo is significantly faster. The cue for the Haydn is rounder and slightly more horizontal than that of the Beethoven because the group is going to play legato quarter notes as opposed to two loud chords. The cue for the Haydn is also slightly smaller than the Beethoven, as the Haydn begins in a piano dynamic while the Beethoven begins in a forte dynamic. Although both of these pieces are essentially in three, because of the differences in the quality, character, dynamic, and tempo of the opening sounds the cues embody much different information about the nature of the music.
5.2 Nature of Cues and Signals

I argued in chapter 2, section 1.3 that the timing and predictability of cues and signals in string quartet performance may vary. One of the reasons for this is the high degree of coordination that string quartets strive for during rehearsal and demand of each other during performance. As noted by Young and Colman,

> The interaction between the players is of such a nature that mis-timings even of a fraction of a second, minute hesitations, slight differences in intonation, tiny misjudgments of dynamics and so on are regarded as monumental blunders even among musicians with quite modest pretentions.¹²⁰

With expectations or demands of this level or degree, any slight physical (and sonic) variation a player makes is typically noticed and, ideally, incorporated into the group action. For example, if a player unintentionally moves in a different way, that cue during silence or signal will convey different information that all members will need to coordinate with. Or if a player is engaged in spontaneous musical variation they may intentionally change an expressive or temporal aspect about the cue or signal. One other variation in cueing and signalling gestures occurs when performers are playing in different performance spaces, which will most likely have different acoustics. In different contexts the sound that musicians hear changes, which may slightly alter gestures. This is because players may have to make slightly different movements with their body in order to achieve the sonic results that they want. For example one participant mentioned, “But of course a larger, echoey … more echoey space needs more time in between, more articulation, more space in-between gestures … [but in] an intimate space, but I think there’s absolutely no need to project, in fact just the opposite, [I] look for the smallest colours” (interview with Cello String Quartet B, January, 2014). Because there is such high demand for precision during string quartet performance group members need to stay highly attuned to any slight variance of movement (and sound) that could possibly affect timing and/or predictability, in order to stay synchronized with one another.

One of the magical aspects of string quartet performance is the seemingly flawless way that the group creates sounds together. Yet executing notes exactly in unison, both physically and

sonically, is beyond human capacity and ability. In a study out of Uppsala Sweden, Rasch (1988) used a computer to analyze note onset among professional musicians in a string trio. Interestingly, he found that the instrument playing the main melody (which was the violin in this case) sounds 5-10 ms earlier than the other instruments.\(^{121}\) Based on this finding, Goodman (now King) argues that, “In effect, therefore, the art of performing together is to create the illusion of perfect ensemble.”\(^{122}\) As a frame of reference, the human perceptual threshold for detecting asynchronous note onsets is 30 ms.\(^{123}\) While an exact “lock” or togetherness is not really achieved, the differences in timing among a string quartet that sounds and “feels” together are very small. Cueing during silence and signalling are some of the ways that help string quartet musicians attempt to start the onset of notes and perform them throughout a piece as precisely together as possible (when directed in the score to do so).

The possibility of accomplishing such tight synchronization is increased when the intentions of the movements of the cue are clear. Moreover, just as gesturing clearly is vital, reading them—especially cues, signals, and markers—is also central to achieving the illusion of perfect ensemble. With this in mind I want to suggest that there is an element beyond near perfect execution in terms of timing during sound producing acts that can join musicians together. This relates to the shape of movements and the communication of emotion as interpreted in the piece even before any sound is made. Because quartet members move together before they play, gestures and the meanings behind them aid in the unification of group intent and expression. This in turn facilitates perception of tight ensemble or coordination both for group members and the audience.

Unlike cues during silences, signals occur during the creation of sound or during passages where the pulse continues, even if there are short pauses throughout these phrases. Like cues, signals are also vital to maximizing coordination between quartet musicians. To demonstrate the


cohesion that can be achieved through signalling, I discuss a video of a group (see Video 5, page 105) playing the four last bars of Schubert’s *Quartettsatz* (see Figure 6, page 105). There are two large signals that the group makes, one before the second last bar and the second before the last bar. The motions that they make are quite similar; big movements with the bow coming high above the strings. However the signal before the last bar “reads” as slightly more final since they lift their bows even higher into the air and when they play the final chord the musicians’ body positions are lower. These motions indicate that the sound the quartet is going to make will be very strong, loud, and final.

![Figure 6](image)

**Figure 6.** Schubert *Quartettsatz* in c minor, bars 312-15.

![Video 5](https://youtu.be/kdkGzDlrl6w)

Because the gestures between each of the members are similar, it helps to coordinate the group and unify their musical intentions and expression in regards to attack of the note, the duration of the note, and the final release of the note. Also these kinds of signals help strengthen the
perception that the group is committed to performing this action together. Signals, similarly to cues during silence, help group members match their gestures and subsequently the resulting sounds.

5.3 Familiarity

String quartets generally discuss and negotiate very specifically how they will cue an upbeat to a piece or a new section. This ensures that all group members will be aware of how the group is thinking about subdividing the beat(s) before any sound starts. Often starting together can be one of the more challenging parts of string quartet performance and ragged beginnings stand out to an audience. The person who is initiating the cue during silence will imagine the subdivision of the pulse and internally give him or herself a pre-preparatory cue of the pulse (interview with Viola String Quartet D, November, 2013). It is to be expected that the other group members would be aware that the initiator mentally prepares to cue by using these subdivisions. In some cases, when groups are having difficulty starting precisely together, the other members will request (verbally) that there be an even smaller outward physical cue that reflects the subdivision of the pulse, before the “real” cue is given. This helps by giving them more time and hence opportunity to sync with the pulse of the initiator. Such important details help the responders to be able to predict the actions of the initiator. They can develop quartet members’ ability to sense what different musicians are thinking and feeling. As a result, when finally, the initiator shows their cue, the other members of the group are better able to embody the movement together, and thus create and convey the sensation that they are “playing ‘with one mind.’”

Within a string quartet the movements and communication that develop over time can become quite predictable. One participant noted that,

> I know long before she cues that she is going to cue, and I sit beside her, so it’s quite easy for me to sense. I’m quite aware that there’s a moment where she kind of starts thinking about cueing, and from that point her motions kind of embody a certain pattern, and then I kind of know when she’s going to cue, before it happens. (interview with Violin 2 String Quartet E, October, 2013)

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In this instance this musician is describing the ability to foresee what will unfold. Being able to predict the actions of other ensemble members is generally seen as ideal in string quartet performance. This kind of anticipatory competence can be useful within groups and can help enhance performance synchrony. Further, this type of knowledge—the ability to anticipate action and to read co-performers’ movements—facilitates empathetic creativity. However if this kind of anticipatory predictability does not lead to empathetic creativity, a central value will be lost and the musicians may become bored if their group’s music making becomes too predictable.

### 5.4 Intention

During rehearsal, for example in the rehearsals of String Quartet D, discussions usually ensue about the character of cues and signals. This is especially true with respect to cues during silence, which not only initiate, but also frame the music that follows. The cue that starts a piece in many ways provides the inspiration for imagining the sound or sounds that will be realized and reflected in the physical movements during the course of a performance:

> We’re always hearing a little bit ahead and then trying to create as we go, so hearing a little bit [ahead] and then hearing what we want to come out right before it comes out. In the same way I think that the physical manifestation of that would be that we, especially before we start something if there’s silence or something, that we hear what sound we want, or what gesture we want, or kind of attack, or character, and that our breathing or our cueing together reflects that. (interview with Violin 1 String Quartet C, December, 2013)

A study by Keller and Appel (2010) investigates the skill and the role of hearing ahead in ensemble performance, which they call anticipatory auditory imagery. This involves “the use of mental imagery in planning the production of one’s own sounds and predicting upcoming sounds of other players.” As the first violinist of String Quartet C explains, this mental imagery and prediction of group sound is reflected in the cueing gestures that each member makes.

In this next example, a different participant notes that in order to communicate physically in an effective way, it is important for the body to be centred. She explains that if the body is not

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125 Seddon and Biasutti, “Modes of Communication Between Members of a String Quartet,” 118.

explicitly in this ideal state while cueing during silence, the other musicians will not have enough
time to react to the movement,

So it’s a combination of tension and relax[ation] and I think it’s very important to
balance our body to be able to communicate something. So if I bring it too high it
would be too tense, nobody would understand. The time of reaction [is] very
important, if the cue is too sudden or too tense or too rigid, then there’s no time to
react. The other people have to react as well. It’s like starting a movement, we
have to lift the leg, we cannot just go directly to the movement, [we need] what I
call a preparation. (interview with Violin 1 String Quartet A, January, 2014)

This violinist raises two important points. The first is that the body has to be centred in order for
the physical preparatory motion to be well prepared and subsequently understood by others. I
interpret centred to mean grounded and relaxed, but ready for controlled action. When the body
is tense, often body language becomes abrupt, making it difficult for other members to have
enough time to respond. The second point is about the importance of the preparatory movements
of cues during silence in ensuring that the whole group has a chance to move and then play
together.

While cueing and signalling gestures help musicians communicate with one another nonverbally,
cues during silence are so important that there is usually much negotiation and discussion about
them prior to performance. However, a few of the interviewees cautioned against becoming too
self-conscious about the execution of the gesture,

So we’ll talk about that [the cue] very, very specifically, but then on the other
hand, to get too self-conscious about this makes it not really real, like it’s not
really integrated in what you are playing. (interview with Viola String Quartet D,
November, 2013)

In a manner similar to the participant who cautioned about making too many technical
calculations in your mind, this participant notes the difficulties associated with breaking apart
instantaneous or action information. Although cues can be discussed and practiced in detail,
there is a point where these gestures can become over-analyzed. This comment also alludes to
the importance of the quality of gestural cues being authentic and somewhat spontaneous.

There are many different elements about cues during silence that have to come together in order
for the responses to be successfully executed by all members simultaneously. Usually one person
is in charge of initiating the cue during silence, a role that comes with particular responsibilities.
One participant mentioned her experience of potential self-consciousness and anxiety when being in charge of initiating the cue,

Sometimes you don’t want to break things down too much in your mind, so I’m sorry if I’m too abstract, but I do think that when it comes to that kind of interaction, like I think you can sort of proportion your focus so it’s almost like a focus-a-meter, I’m going to be more focused on myself and less on the rest of the group and I think you can kind of play with those levels a little bit, so sometimes in rehearsal I’ll try to cue and [if] I’m too self-conscious or I’m too worried about people coming in, and then I’ll have [to] re-proportion my focus so I’m feeling my own gestures more strongly, and sending them out more strongly, and taking in less info from everyone else. (interview with Violin 2 String Quartet E, October, 2013)

This participant notes that a great deal of personal focus is needed for her not to over react to the group when she is in the role of initiating the cue during silence at the beginning of a musical idea or phrase. As McCaleb proposes, playing chamber music is a very reactive, even inter-reactive, activity. The distinction between action and reaction is very subtle. When the second violinist of Quartet E is in charge of initiating a cue, she is able to observe her colleagues’ bodily reaction in that split second following her own initiation. At that moment, or almost immediately after it, she can already feel that the reactors may not play exactly with her, and so she in turn adjusts her own actions. These are necessary and normal adjustments for players to make in order to start the onset of notes perfectly together, and also so the “feel” of doing this is unified. The positive outcome of this type of interaction is that the very beginning sounds of the music are expressively and technically convincing and accurately coordinated. However, if the initiator adjusts his or her cueing gesture too much in an effort to play together problems can ensue. For example, the musical expression can become secondary to the goal of timing in order to play “perfectly” together. It is also possible that the initiator, who in this situation is reacting to the (re)action (the adjusted cue) still cannot maneuver in a manner that allows him or her to play in close enough synchrony with his or her co-performers. This is most likely because the body movements of his or her co-performers are all indicating that they will start to play in differing places. Further problems also arise when the supporters—those musicians who mediate the cue or reinforce it for other responders—also begin to do this. This can result in all of the players hesitating to play, as they are all waiting for each other. In this case the beginning sound is also usually hesitant, with people unconfident as to exactly when to begin to play.
The way that the above violinist solves such dilemmas is by changing the focus of her attention to her own musical ideas and movements, and the intensity with which she physically communicates them. In addition to highlighting the importance of shifting attention, and perception of nonverbal communication as a form of practice, this illustrates the importance of trust within the group. This trust involves the belief that once the action of the cue has been initiated, everyone knows what is being communicated and will follow through with the gesture. At the same time groups will get to know each other’s individual tendencies with respect to both action and reaction time for any given cue or signal. The development of trust and familiarity is central to building a gestural dialect within the group.

The cues during silence and signals exchanged between string quartet members during performance are an important part of their nonverbal communication. They help facilitate the synchronization of feeling and tempo of the music almost instantaneously. During these moments, musicians are able to establish a connection between one another, which helps balance energy and intention within the group. Thus it is vital that all members develop an understanding of these communication processes. This understanding combined with the skill of anticipatory auditory imagery and trust within the group, results in cueing and signalling gestures that are suitably firm to be clear but flexible enough to allow for different performance venues. These gestures can provide all four group members time to establish trajectories to start playing and continue playing as closely together as possible. String quartets are always striving for closeness of ensemble, which begins with the very first musical sound that a group makes on stage. Doing so means that it is especially important that both initiators and responders clearly understand their roles in the process. Preparatory and signalling movements have a unique place in the gestural language of string quartet playing. As preparatory motions are made during silence, they are very much linked to mental conceptions and anticipations of what will unfold during the performance. As signalling motions are made while the group plays, they are very much connected to shaping and slight variations in the music as well as confirming that all members are moving forward in a similar manner.
6 Pulse, Cues/Signals, and Gesture

One quartet member pointed out another interesting issue related to cueing (in a broad sense, not only during silences) when playing music with complex rhythms and metres, which happens more with contemporary music. This violinist told me,

I think the wildest thing we ever played was Xenakis *Tetras*, and I devised a whole system where I’d circle around with my scroll. I don’t know if you’ve ever seen a score for that but, everyone is just doing wildly different things, 7’s against 5’s and all this crazy stuff, and I figured out this way to circle, cause I’m playing those kind [of] rhythms too, and it sounds horrible, but I found a way that I could circle around with the violin where the bottom of the circle was the downbeat, so I could, because I was also playing complicated rhythms off [of this]. (interview with Violin String Quartet B, January, 2014)

These types of signalling systems approach characteristics of conducting patterns, as the participant talks about using signals continuously while playing. Even though this participant shared this information with me, he implied that it was unfavorable to be making these circular patterns to coordinate the group. However, in music with very complicated rhythms and unregulated metres it can be difficult to coordinate a group that is playing without a conductor. Ultimately, coordination of sound is the primary consideration with priority over any other aspect of the performance. Thus, while in many instances, overt gesturing might suggest lack of preparation and even skill, allowances are made for music that is perceived to be especially rhythmically complex. In this sense, there is a kind of aesthetics, or even politics, to signalling and cueing, since a perceived overabundance of cues in what is idealized to be a self-conducted ensemble might read as amateurish. This is alluded to when this participant remarks, “… and it sounds horrible …” The stakes for using signalling systems increase if the signals fail or, perhaps, if one or more of the other musicians feels that either the signals are not necessary or that one musician is trying to exert too much musical control. On the other hand, as the example above shows, such gestures can prove to be absolutely necessary for an idealized performance, at least in terms of sound. At issue is what constitutes that ideal, the perceived difficulty of the piece—both by the musicians and the audience, and who is authorized to take control of the performance.

Like the violinist from String Quartet B, I have also noticed that the Cecilia String Quartet relies more heavily on explicit cues, signals, and physical gestures in music that is more rhythmically
and metrically challenging. With a specific metric grid the music often seems to flow by itself because the pulse is more regular. In other words, players can easily coordinate their playing, and in particular their gestures, in relation to a more regular shared pulse. Even so, it should be noted that different people perceive the pulse differently—some rush, some drag, some play on top of the beat, etc. At an elite level of playing and performance the bar for time competence is much higher. In the case of music with a constant pulse the ongoing and very subtle adjustments necessary for this level of synchronization become rather automatic. Yet various kinds of subtle ongoing cues, signals, and nonverbal communication still happen throughout the performance. Moreover, the regularity of a piece’s pulse puts even more pressure on those moments when it is supposed to change—*ritardandos, accelerandos, fermatas*, etc., which demand a more radical deviation from grooving along, and will be talked about below.

One participant mentioned physical gesture in relation to the pulse of music and how his group uses this pulse and the flow of music as a platform for understanding gesture:

> And, so we are using gestures, and really actually tying them to the pulse of the music, and how we are feeling that pulse. So that the technique is coming either off of, or in anticipation of, something that has to do with that pulse. That way there is an artistic flow to what the communication will mean, and there’s something, the communication isn’t just coming out of anywhere, and you have to figure what it’s tied to. But it’s always tied to the pulse and the gesture of the music. (interview with Violin 2 String Quartet D, November, 2013)

It might seem self-evident that the gestures are oriented around the pulse for music with a clear and strong metre. Even so, how, where, and when these gestures deviate from the musical pulse are artistic choices and depend on the agreed upon interpretation of the group. Part of the development of group gestural competence is about these artistic decisions and agreement on their relationship to the pulse and subsequent accentuations and stresses that occur throughout musical passages. Gestures suddenly breaking away from the pulse, then, might well signal that something drastic is happening. In my experience, players do not suddenly break away from the pulse spontaneously or markedly, unless all of the other members are aware of the context and rationale, either through the score or as worked out in rehearsal. There may be slight variations or deviations with regard to pulse and gesture that players make throughout the course of performance that can add a lot of nuance and freedom to the group’s interpretation, but unplanned, radical, or sudden changes would result in sonic chaos.
In contrast, music that is less metred requires quartets to rely more heavily on cues—especially cues during silence that tell the members to start again as demanded by the score. These physical movements are related or derived from anticipatory auditory imagery rather than responding to a pulse. Suggested by all of this is that cueing gestures are shaped significantly by the character and type of pulse and metre in the music and especially, its flow or lack of it.

Subsequently in the interview the above-quoted violinist spoke about explicit technical accompanist signalling movements that his string quartet makes to communicate with one another about the pulse. For example, he noted that if one member (presumably a violinist or violist) were to give a little “bump” with their instrument, meaning to raise their instrument up from the scroll, it would mean to move forward on the pulse. On the other hand, if a player (which could include cellists) wants to pull back on the pulse, they would lean their torso backwards. Although these movements are technical (as opposed to artistic) in nature, the violinist pointed out that they are always related to some musical idea and that all the group members realize their meaning and relationship to the group’s artistic goals. So while the bump up by a violinist or violist might appear to simply mean “play faster,” it could also indicate to create a more joyful or anxious character. Similarly, leaning back does not just mean “play slower,” but could indicate a more serious character. Leaning back could also potentially mean more reserved or introverted, or even in some instances to play more quietly. Although there can potentially be several different meanings associated with these kinds of movements during performance, with time and experience string quartet members are often able to immediately understand which particular meaning someone is referring to when they make these movements.

This violinist said that, “… in the quickness of the moment, not that one member is connecting it to a pillow and the other a door, this is also discussed in rehearsal, [but that] communication [is] fed into a common goal” (interview with Violin 2 String Quartet D, November, 2013). This is part of the development of familiarity and competence between group members, and also a realization of the group’s artistic values and goals.

In music with complicated rhythmic structures and in less metrically structured music that has more stops and starts, there is more need for variety and difference in conceptions of cues, signals, and physical gestures, especially those cues made during silence. On the other hand, in music with a more regular pulse, gestures will be made in and around this pulse, to help create shapes and articulations that reflect the structure of the music. Although the movement of these
gestures can be technical in nature, they will also be feeding into an artistic goal, the specific meaning of which will be understood by all members in the group.

7 Efficiency of Motion and Small Gestures

Many participants mentioned the importance of efficiency of motion and of small gestures when playing. The violinist of Quartet B said,

I like the body movements to be minimized to a really effective movement that is communicative, it’s clear too, [so] that [it] projects everything that needs to be projected, but it’s not disturbing. (interview with Violin String Quartet B, January, 2014)

Notable is the point this participant makes about the gestures being clear yet subtle and therefore understandable to other members of the group. Arnold Steinhardt, formerly of the Guarneri String Quartet, agrees about the importance of movements not disturbing the line of the music when he says, “It’s important not to allow our gestures [implied physical] to distract from the line of the music. Whether we like it or not, the audience takes in the visual aspect as part of the experience.”127 While this quote is directed towards those gestures that audiences notice, which may or may not be the same as those central to communication between string quartet members, the first part of the quote emphasizes the importance of gesture in helping to create the longer phrases in the music. String quartet members use these kinds of gestures, a combination of figurative and effective gestures, to communicate about musical direction and shape with one another. Yet Steinhardt’s statement also stands as a warning to performers against using random, wild gestures to grab the audience’s attention simply because they may look good or generate excitement, when in fact this overtly visual component distracts the audience from the sonic experience of the music. Also these kinds of extremely exaggerated movements can make it difficult to play the instrument properly, which was pointed out by the first violinist from String Quartet E (see page 89).

Another reason for using more efficient motions to play pertains to being able to sustain a performance career in the face of the demands of frequent performance. As the cellist from String Quartet D noted, “we as players have become more efficient out of necessity because we

127 Blum, The Art of Quartet Playing, 10.
play so much” (interview with Cello String Quartet D, November, 2013). This is usually related to injury and/or soreness in the body due to tension from over-use or over-extension of muscles and tendons. Although these three quotations focus on different modes of movement within the context of nonverbal communication, they all point towards the importance of gestures that support the line of the music and the ability to sustain these kinds of movements over long periods of time.

Two participants commented on the contribution of small subtle physical gestures, or signals, in helping coordinate and synchronize players on an ongoing basis throughout a performance. They are used almost solely between players and the reason for using them is to facilitate musical unification. According to one violinist, small signalling gestures can minimize errors of interpretation between ensemble members, because they are more direct,

I think on the technical level, we use a lot of very small, very subtle gestures, because those … [hold] the least amount of room for error, both for interpretation, and on execution of the nonverbal communication. (interview with Violin 2 String Quartet D, November, 2013)

Another participant mentioned the use of small (physical) gestures for the purpose of synchronizing players during performance, “I think that in performance we use a lot of breathing, a lot of general gestures, and, some very practical small gestures that we look out for, for ensemble” (interview with Cello String Quartet E, October, 2013). In many instances, the physical gestures that are used between members in an ensemble for coordination are actually made with smaller motions. String quartet musicians sit fairly close together, so it would make sense that physical gestures used to facilitate more practical aspects of synchronization and coordination between members could be smaller.

8 Visual Perception of Movement and Interpretation of Gestures

8.1 Left and Right Hands

There are many ways in which the movements seen by string quartet members can help facilitate various aspects of their performances. This information is used to confirm what players are hearing when it is more difficult to hear a particular instrument, as often happens to musicians who sit across from one another. This visual information can also be used to predict what will
happen sonically. In this section we will focus on those smaller movements that provide such information.

First of all there are matters of synchronization that can be helped by simply looking at the movements of the left or right hands of the other musicians. By looking at the right (normally, the bow) hand or arm, players are able to get information about when a note will start or when a note will change as long as the player is aware of which notes are being slurred and which notes are not slurred as well as the time it takes for each particular instrument to “speak.” Typically the bowings of passages are discussed in detail during rehearsal, especially those passages where players have similar musical material. In these instances, the players will be aware of those notes each instrument has slurred, and also often which bow direction they are supposed to playing. However, there are some problems associated with watching the bow for matters of timing, which will be addressed later in this section.

Beyond matters of bowing and synchronization, other information can be gathered by looking at a string player’s right hand. These elements may be used less frequently—I find that I rely more on my ear to realize and fix differences in sound quality. However in some cases, it is possible to look towards the bow for this information or for confirmation about what I am hearing. The tilt of the bow conveys how much bow hair the player is using, which gives information about volume and density of sound. By assessing how close or far from the bridge the other musicians in the quartet are playing, one can derive information about volume and thickness of sound—close to the bridge being thicker and away from the bridge being more transparent. Finally, the speed at which they move the bow can (sometimes) indicate volume and also the density of the sound. For instance if a player is moving the bow more quickly across the string not using much pressure, and tilting the bow to the side, the sound will be filled with quite a bit of air. Combined in different ways with different results, this information is directly related to the dynamic, colour, shape, and texture of the sound which a player produces. These variations in the sound will impact the blend and balance of the group. The visual elements can be combined with sonic information in order to provide a complete collection and combination of nonverbal information.

Matters of timing can be detected by looking at the left hand as well as the right hand. For example, it is possible to gather information about note changes from the left hand, especially when the notes are under a slur. In these instances, even if bow direction does not change, the
left hand still has to move to stop the new note. The player will undoubtedly look at the left hand for this information. If the bow is changing with the note change in the left hand it is possible to look at the bow, but there are some disadvantages to doing this. Cellist David Soyer of the former Guarneri String Quartet warns against watching the right hand,

Many people who aren’t greatly experienced in chamber music think that watching the bow is the thing to do. But bow movements can be deceptive. Sometimes you move your bow before it makes actual contact with the string, or sometimes the string doesn’t speak immediately. The finger, however, normally strikes the string just when you play.¹²⁸

This is true once you begin playing and are in the middle of playing. However, before string players begin to play, it is possible that they could already have their left hand on the string in preparation. As discussed in section 5 of this chapter, string quartet players must take into account a number of elements to coordinate the beginning of a sound. From the perspective of the violist who sits on the outside of the group, I will look at the bow arm and not the left hand of the violinists when note changes are really fast and there are no slurs. However, I will not look at the cellist’s bow because it is moving horizontally and difficult to see from my position in relation to the cello. I find it easier to match my bow changes (and therefore tempo and timing) to a violinist’s bow, rather than looking at their left hand, which is moving too quickly for me to be able to match.

Still, in many other instances, it can be useful to look at a player’s left hand. For example, information about the speed and amplitude of vibrato being used is readily discernable. Seeing the movements used to produce vibrato make it easier for ensemble members to use the same width and rate of vibrato. Although this is subtle, the degree of precision sought by professional string quartets necessitates this kind of awareness. Key, then, is that information gathered through seeing gestures must be tempered with particular knowledge. In this case, the critical element is to be watching the parts of the body that will provide the most accurate information at any given time. Of course, this is combined with information that is available in the sound.

¹²⁸ Blum, The Art of Quartet Playing, 14.
Different variables affect the kinds of information players pick up from watching their colleagues. These variables include the particular technique of the player that is being watched and other details of the musical or technical situation. For instance, during a fast passage, the left hand will convey an accurate account of when the notes are changing. This is facilitated by the fact that its action, while quick, will also be fairly firm. During a slower or more legato passage, where there is more flexibility in timing, the left hand may be more fluid. How high each player lifts their fingers off of the fingerboard will also vary, depending on the player and the musical situation. Ideally bow changes are coordinated exactly with the change of the left hand. But how bow changes are made through a combination of the arm and finger movements can vary between players, which include more or less use of the flexibility of the fingers on the right hand. This varies from player to player as well. And as mentioned previously by cellist David Soyer, when exactly the note will “speak” on the instrument can vary. Necessary for any player to be able to make the best use of watching ensemble mates is an understanding of all the different variables that affect how sounds are produced by specific gestures in different contexts.

Thus, deep understanding of the music being performed, the techniques specific to the instrument being played by the other musicians, the particular technique of each performer, and their use of gesture as it relates to interpretation is vital. Some of this can be based on knowledge of playing one’s own instrument. For example, on any string instrument it is normal that, in the midst of playing, the left hand will strike the string when the note is going to sound. However, this knowledge must be tempered with awareness of how long each instrument needs to sound. These are very small differences but they can contribute to greater synchronicity of sound within the group and more. As noted by a violist, who sits on the outside of the group, even the small movements of the left hand are rich with meaning:

"You’re showing me the emotion, specifically and leading the line with the left hand, which is vibrato and how the fingers go down, and everything about what the hand feels like. You’re becoming very conscious of that while you’re leading somebody, and then the person who is responding to that, what we usually say they are trying to feel like their hand is your hand. (interview with Viola String Quartet D, November, 2013)

By watching his colleague’s left hand, this particular musician is able to synchronize his playing with that of the other musician who is leading him, and aided in his attempt to embody his colleague’s expressive or emotional feeling."
8.2 Melodic Voice

Body movements may also be used to highlight important musical material. Players use gestural positioning to let the audience know who has the melody at a given time in a piece of music. A violist carrying the melody but sitting on the outside may turn a little more towards the audience as a signal. By contrast, musicians sitting on the inside commonly straighten their posture to a more erect position when playing the main melodic line. Some even use their legs to elevate themselves slightly. Melody players in particular can also increase the energy of their physical movements when they want to highlight a particular spot or passage for their colleagues or the audience. This is also a common tactic when they are in charge of leading the group. One violinist gave an example of the cellist, who sits inside in the group, doing this:

Maybe our cellist might have a passage where he’s leading ... you can maybe see him amp up his movements, and the three of us kind of back down a bit or mimic him a little bit, and then you can see it going in different directions. (interview with Violin 1 String Quartet D, November, 2013)

These variations in movement are dependent on the musical score. For example, when the members of String Quartet D are all playing the same musical material and the cellist is in charge of leading, the three other players mimic his movements so that the group presents a unified musical idea. However, if the same cellist is in charge of leading and playing the main melodic material (two things that do not necessarily have to go together) the other players will likely make smaller movements than the cellist, in order to feature his playing. In this situation, usually it is clear that only the cellist is playing the main musical material and the whole group agrees that this should be featured as a prominent role. Besides drawing attention to oneself, intensifying body movements is one of the possible physical adjustments players can make for increasing the volume of sound on their instrument. As the above violinist also notes, the members of his group takes turns doing this, depending on either the musical material or decisions made among the members about who is to lead a particular passage.

Often there is a hierarchy between voices in the string quartet, especially in music from the classical era including works by Haydn, Mozart, and early Beethoven. In these compositions the score often dictates leadership:

I feel like, just because of the writing, I don’t think everyone is talking at the same place or level at the same time, and it can’t just be one person either, and so that’s
how the quartet music is written. I think even if we are somehow playing music at the same time, we sort of alternate being the person doing the main, leading of the communicating and the other three sort of, take turns, I mean everyone takes turns nodding or talking, communicating or answering … (interview with Violin 1 String Quartet E, October, 2013)

Even though what is written in the score might strongly indicate who takes on more of a leadership role and when, it should not be assumed that the melodic voice is always leading in performance. There are many variables that can affect which instrumental part or person provides the most effective leadership at any point. Brinner (1995) argues that leadership being assigned traditionally to the first violin (or melodic voice) is a superficial view and is contradicted “by the fact that the leadership responsibility is not necessarily linked to the domain of melody – an ‘accompanying’ part often sets tempo and dynamics or initiates a phrase.”

In some situations it is more practical for a rhythmic supportive line to lead the group, so that the melody can float on top of this musical cushion. One participant mentioned that his group espouses this strategy: “We have built our quartet to be really led by, so whoever has the melody, we let the non-melody people actually lead a passage, so sometimes the melody has no stress in its sound and in its line and it can be free to sing” (interview with Violin 1 String Quartet D, November, 2013). In this case the body movements of both the rhythmic supportive line may be “amped” up to provide this cushion, or even the movement of both the rhythmic supportive line and the melodic voice may be amped up together, and in some sense lead the group together.

Furthermore, this interaction can change over time depending on how familiar the group is with the piece and also how attuned the members of the group are to each other at any given time:

If I [playing the viola] do the bass line in the Mozart quartet for a while let’s say, and the cello has the main line, the theme, so I feel first of all, first reading I will be [really] listening to what the cellist wants to say with this line, and what he [would] like me to do to support his line, the way he likes. But after a while I will show some ideas, I would like him to play his line, so I will start to show different[ly how] to move more, let’s say to indicate more phrasing th[ey] way I play, the way I will show it, but personally I don’t move that much, so it’s a very little thing sometimes, like I said I’m doing something different than I used to do and if in this example when I play the line with [the cellist], I know he’s sensitive

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to listening to what I’m doing, also, so I feel free to indicate something different.
(interview with Viola String Quartet A, January, 2014)

This description alludes to how the instrumental parts become musically integrated as the players adapt to one another and as the balance of leading and following shifts between players in real time, often in very subtle ways. Although this player commented that he does not move very much, he says that he shows or indicates (most likely through the sound in this case) a slightly different interpretation of the phrase after the group has become familiar with the music.

Another participant described how the initiator often alternates between players, sometimes with surprising frequency,

It’s all happening very quickly, and actually even when you aren’t leading you are still on that 49 and a half % leadership, and so, your gestures still need to be, you know sort of, like taking your pinky and moving it there or there [he moves his pinky finger very slightly from side to side], in terms of the strength of your leadership. So in terms of the communication, because you could be just in charge of communication [of] a very quick transition over a bar line, and so if you’re not actively leading, on that 49 and a half % level, there’s no way you can jump in for just over that bar line. (interview with Violin 2 String Quartet D, November, 2013)

In this sense, there is actually very little difference between the initiators and responders in terms of action and responsibility. In order for the music to sound together, it is important that all members take an active role. So the responders exert a certain amount of control over what will happen, as the group works together as one unit. When all members are working together there is a great deal of reciprocity happening within the group and the players are truly inter-dependent on one another. Brinner also alludes to this when he talks about cue and response. I venture that for string quartets this is constantly happening as they play. As noted by Brinner, “Such rapid response to cues, particularly unexpected ones, can generate great excitement for performers and audience.”

The constant interplay between all quartet members as shared leadership shifts around the group, and different players bring out different melodic or supportive lines, requires ongoing subtle adjustments to physical demeanor, energy, and gestures.

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130 Brinner, Knowing Music, Making Music, 186.
8.3 Spontaneous Moments

Visual connection is also helpful during sudden or surprise moments that occur in performance. An important example of this is when the expected trajectory of the music gets disrupted. This may happen when it is written into the score, or when something happens in the performance that deviates from what is written and/or what has been rehearsed. In both instances, there may be a sudden change in the energy or demeanor, one planned, the other spontaneous, but both ideally seeming spontaneous. The second violinist from Quartet C talked about spontaneous musical variation when he said,

If I see out of the corner of my eye that, ‘oh we’re going to do something bigger here,’ then I’m going to try to match that even if it’s not the kind of thing that I can follow in the sound. To get to that same conclusion, then it’s a visual thing, where ‘oh this needs to be sudden,’ you can’t follow the trajectory because it’s a surprise so that’s often when we rely more on the visual. (interview with Violin 2 String Quartet C, February, 2014)

Here the violinist receives a visual cue in his peripheral vision to play more loudly, which was made by his colleague, either intentionally or unintentionally. This visual cue was noticed in anticipation of the sonic information. There are three basic times that visual cues can be observed by a receiver: before, simultaneous with, or after the sound has been created. It would seem practical that if visual signals were going to be used to facilitate a moment of spontaneity, then they would need to be made sometime before the sounding moment of surprise. This would be the case both for surprises that are written into the score and spontaneous musical variations. In the case of surprises that are written into the score, members of the quartet expect the “surprise” and know to look up or foreground their peripheral vision in order to facilitate the execution. In the case of spontaneous musical variations, members have to trust that the other musicians are paying attention on a continuous basis during performance for any slight variation in physical movement. Alternatively the cue before the moment of spontaneity has to be noticeable enough for everyone in the group to receive the message. Sometimes I have found in my experience, moments of surprise, variation, or deviation can also be “sensed” or “felt” ahead of time by members of the quartet, which may also cause them to look up, or use their peripheral vision. This is likely related to the development of familiarity between members.

Another instance in which anticipatory visual contact is useful is when there is going to be additional time or rubato taken somewhere within the movement. Often string quartet musicians
are aware ahead of time that at a particular point in the music there may be slight variations from what is indicated in the score. Thus, they will be ready to look up. Again, when the musicians are not expecting a deviation such as any extra time being taken, a physical warning of this unexpected change is necessary. In this case, the musicians will likely catch the warning in their peripheral vision as the second violinist of Quartet C suggested. Usually it will be the initiator who may take such liberties, as everyone’s attention will be slightly more focused on this person in that particular moment. Still, such impromptu alterations in performance can be somewhat risky, as it is hard to be sure that all musicians will catch the cue. Further, the stakes are high: if they do not catch the cue, they will likely not be together. But these moments can also add excitement to performances, as musicians continuously musically challenge one another to greater levels of attunement.

8.3.1 Example of a Spontaneous Moment

A useful example of how quartets use gesture to facilitate spontaneous variation is in bars 67-78 of Schubert’s Quartettsatz (see Figure 7, page 124). In this performance the quartet takes the first repeat so they play the first half of the piece two times. The difference between these two renderings of the first half of the piece (see Video 6, page 124 and Video 7, page 125) is most apparent in bar 70. The second time they play the passage Violin 1 makes the cue to play bar 70 as he had the first time he played it, but as soon as he starts playing it for the second time, his body actually becomes much softer. The tension is released and his shoulders and midsection relax. This makes the sound he is producing softer as well. Violin 2 notices this difference in movement and sound quality, and acknowledges it with a gesture of his head just after the group begins to play the measure. Specifically, he sticks his head in towards the group as Violin 1 begins playing the ascending scale, making a much different movement than he did the first time he played this passage. The result is that bar 70 is quieter and the forte sforzando on the downbeat of bar 71 is gentler than it was the first time. Subsequently the increase in tension and crescendo towards measure 77 is greater on the repeat.
Figure 7. Schubert *Quartettsatz* in c minor, bars 67-78.

Video 6. First repeat of bars 67-78  https://youtu.be/3z9PdM_5WKQ
The nature of the spontaneous musical variation in these examples, as it is in string quartet performance in general, is quite subtle. However this kind of variation attests to the group being truly engaged and synchronized with one another. They are able to change their demeanor, musical character, and sound, and group members are able to respond to such changes, within fractions of a second.

Besides facilitating and showing interpretation, gesture connects group members through sound and vision, providing a means for members to communicate and react to spontaneous variations that they engage in while playing. All of this is helped by familiarity between group members who over time become even more able to notice and respond to smaller and smaller gestures, which can take on more and more meaning over time. This is part of the process of developing a gestural dialect within the group.

9 Gestures for Accomplishing Specified Directives

9.1 Accelerando and Ritardando

Many compositions that are otherwise metrically and rhythmically simple involve passages that explicitly speed up or slow down. Such moments are typically notated in the score with the directives “accelerando” and “ritardando.” In other instances musicians subtly speed up and slow down in places that are not notated but are matters of interpretation on the part of the performers. This is known as rubato. Nonverbal methods of executing these fluctuations would be the same in such instances.
While common, tempo changes can be tricky to execute with tight synchrony. A common solution was discussed by the violinist of Quartet B, “But there are a lot of accelerandos that are hard to do in that piece, because there are syncopations during the accels, so I find myself bobbing a bit more than I would normally, to sort of curry support for what I’m doing” (interview with Violin String Quartet B, January, 2014). As noted by this musician, it is often useful for the performer signalling to physically mark the pulse that they are feeling by moving a part of their body. Doing so is a direct way to unify the group with the new and/or changing pulse. In such cases, this performer uses gesture more like a conductor both to lead and to connect psychologically with his co-performers. This approach is similar to the way that this violinist talked about engendering group coordination while playing music with more complex rhythmic and temporal structures. In both cases it is difficult for all members to feel a similar pulse. To address this, this participant uses physical gesture to help overcome the challenges of group synchrony in the context of difficult rhythmic demands.

9.2 Pizzicato and Col legno battuto Cues

In addition to bowing with the right hand while stopping strings with the left, string quartet performers use other sound producing techniques that require different cues, signals, and gestures owing to the fact that they are based on motions that differ from those used when bowing. Chief among these techniques are pizzicato and col legno battuto. Pizzicato is when players pluck the string with their bow hand, and col legno battuto is when players use the wood of the bow to hit the string. Pizzicato is recognized as having been first used in 1638. Since then, it has been a regular feature in many string quartets by many different composers. Col legno battuto, first used in 1830, is not employed as much throughout the string quartet literature in comparison to pizzicato yet it does appear from time to time.

From a performer’s perspective, both techniques are difficult to synchronize. This could be partly because string players do not spend a lot of time perfecting these techniques and therefore do not have a great deal of control over how they are executed. In addition, when string players use the bow, due to the nature of the horse hair on the bow, it is possible to temper the onset of the sound. In instances when a player realizes at the last moment that he or she is not going to sound together with the rest of the group, the musician can quickly release the pressure of the bow in order to smooth out the timing difference. However, both pizzicato and col legno
techniques produce more percussive sounds in a direct manner, resulting in an immediate response from the string. Thus, compensating for a lack of precision in timing is more difficult.

A clear indication of the ictus for cueing (during silence) *pizzicato* and *col legno* is important for coordinating the ensemble. One participant mentioned this apropos of coordinating *pizzicato* in his group, “In the sense that they [the cues] were really fool-proof cues and they didn’t have a lot to do with the overall gesture of something super peaceful and still, a lot of little pizzicato, and then you get a cue [he makes a large motion with his hands, indicating a big cue], it’s sort of like an undergrad gesture” (interview with Violin String Quartet B, January, 2014). When this participant mentions “undergrad” gesture, he was referring to a large, mechanical and therefore not very elegant or graceful cue that he associates with less experienced chamber musicians. Despite any sacrifice in grace, the nature of *pizzicato* and *col legno battuto* makes it very obvious if they are not performed together. In an effort to be together, cues and gestures for these techniques can sometimes take a more functional form with less regard for artistry, grace, or visual aesthetics. The implication is that these goals might be at odds in extreme instances. If players are concerned about whether or not they are going to be able to play together during a performance, sometimes they may prioritize the functional and rely on mechanical approaches to physical gesture. Nevertheless, a large cue in the midst of a more peaceful section of the music, even to facilitate ensemble, would be disruptive to the musical line, and it would be more ideal if the cue of the gesture could also reflect the character.

### 9.3 Endings

There are many ways that physical gesture can be used to synchronize the ends of notes, phrases, and movements. In this next example the participant mentions the follow-through gesture of chords at the end of a piece. I think she is referring to pieces that end at a loud volume with all four musicians playing the notes of chords. The release in this case would be a fast one:

> I think it’s [nonverbal communication and gesture] definitely used all the time to enhance, and for example, the way that we end a piece or something. Like follow-through on a chord, if we’re not sort of gesturing in a similar way I think it affects the sound of the note, [and] how it ends. Something as specific as that I think that really does affect how things sound. (interview with Violin 1 String Quartet C, December, 2013)
This statement resonates with the argument I put forth in the Ravel example in section 4.1 of this chapter. Because the attack and release gestures of these particular chordal endings are very fast, they are usually synchronized more intuitively and sonically and less through the visual sense. Yet all members still try to coordinate and match their movements, especially follow-through movements. This is similar for quieter, faster endings as well. When ending a piece that is slower in tempo, regardless of the dynamic, it is possible to watch these gestures and the releases more closely in order to synchronize the ending. It is possible to see how much bow someone has “left” and also to see the bow speed that they are using in order to calculate when they will run out. As a string player approaches the tip, the sound diminishes more quickly. Additionally, if a colleague is running out of bow, players may adjust to stop the sound (even if they still have bow left) when their colleague has run out. In general faster tempo endings are coordinated more through the flow of energy and sound rather than by vision. But in slower tempos, while still listening, it is common to look over to watch another musician’s bow. Of course, all of these endings in different tempos and dynamics where musicians are playing the same musical material, still need to be synchronized through sonic, visual, and/or gestural means to be executed convincingly.

The ability to utilize all of these means toward synchrony is something that is developed over time and is not necessarily a given. That is, some quartets are better at it than others. For example, when a different participant was asked how the gestures of string quartets change over time to become more similar to one another, she spontaneously mentioned the unified ending chords of the string quartet in the previous example,

I think an example is how *** plays their chords, and actually I thought the four of them were always really good at chords and unified gestures. I always thought it was an *** Quartet thing, and whether they notice it, or admit it or not, I’m not sure if they consciously worked on it. But I always was like, wow, the four of them seem so unified in attack and release, and stuff like that, [and] it’s just a result of them spending [so much] time together. I think there are things that we do probably, just because you’re around it. (interview with Violin 1 String Quartet E, October, 2013)

This participant mentions how much of the physical gestural language of a string quartet develops unintentionally, just because the members spend so much time together, rehearsing and performing. Whether or not they consciously worked on matching beginnings and endings of sound and gesture, the result was still that they were well matched in these elements.
Percussionists and researchers such as Schutz (2009), Broughton and Stevens (2009), and Colton (2013), have done research into follow-through (or ending) gestures that continue after the sound has stopped and the impact that seeing them has on audience perceptions of the ending sound. In the context of playing string instruments, these follow-through physical gestures influence both the actual sound as the bow releases the string and subsequently the audience’s perception of the length and character of those ending sounds.

10 Explicit Movements

In contrast to gestures related to specific techniques or instances in the score, several different musicians from different groups identified purposeful movements that they interpreted as having explicit meanings calling for specific action. All of these gestures represent a deviation or exaggeration in the way the instrument is played. Members of the group are still playing their instruments, but in an unusual way. A few of these were:

1) left hand open and away from the instrument means “pay close attention to intonation”
2) holding the instrument up usually implies a brighter colour or a more brilliant sound and more energy
3) instrument down means darker sound, and sometimes a slower tempo
4) relaxing the shoulders means a slower tempo is desired

Although these four examples were mentioned only once by different participants, they are common and broadly understood among string quartet musicians.

The first example is an interesting accompanist gesture. Intonation is a complicated and constantly shifting issue in string quartets, as it is for any individual string player. Usually it is determined by a complex combination of the key centre, the particular chord, and voice leading. Often the upper three voices will by default tune to the cello, but this is only a broad generalization with many exceptions. Regardless, it is through many minute and ongoing adjustments that all four musicians navigate intonation. For this reason, if one person is playing an open string and unable to make any adjustments, everybody must be made aware that they are stuck. One way to do this is to open the left hand, which is usually stopping a note, and move it slightly away from the instrument, like this participant suggested. In this case, everyone else usually adjusts their own intonation of the particular note they are playing around this open string.
The other three examples are relative to specific pieces, passages within a piece, or even particular performances and might well be connected to conversations about the music that took place during rehearsal. None are directly effective movements, but all can actually have a slight effect on sound. For example, holding the instrument up higher (for violinists and violists) will often brighten the sound while lowering the instrument can darken it. Relaxing the shoulders can also release some of the tension in the sound. In this way these gestures can be thought of as both effective and accompanist gestures. More importantly, within the context of the score and situation, the intentions and effects of these actions are quite clear to the musicians.

11 Conclusion

Musicians use effective, accompanist, and figurative gestures in a number of different ways to coordinate different aspects of the score. Within string quartets, gestures serve several ends. First, they serve as a form of cueing and signalling and, at key moments in the score, help players coordinate, mostly through anticipatory processes. Second, they are used as a means to express and as a way to respond to the shape and character of the music, which is mostly done through the sound and through both anticipatory and reactionary processes.

Cues and signalling are important parts of the way string quartet musicians use physical movement to help coordinate and synchronize the group. Signalling gestures are used throughout the performance at places in the score that are difficult to coordinate, usually either temporally or rhythmically. Importantly, cues are always used to signal players during silences to begin to play together. In order to do this, the initiator of the cue will react to the responders’ reaction of their initial cue, so that all players create the same trajectory to begin the onset of the note exactly together. Obviously this is easier when only two people need to create the trajectory together, and gets more and more complicated as players are added. Cueing is a constantly shifting practice of nonverbal cues that shape temporal, expressive, and emotional qualities of the music, even before any sound has been made.

In any discussion with string players about gestures and physical movements that they make to create sound, the concept of technique will emerge because it is a key element in the training and development of young musicians. It continues to be discussed after this intensive learning period is over. The most useful way to view gesture and technique for the purposes of this study is as integrated and as serving each other. Technique may be thought of as the physical precision by
which a player can execute the score, and gesture may be thought of as the physical and mental combination of a player’s conception of the structure, flow, shape, and understanding of the music. The realization of both of these elements is necessary and important when aiming and playing at elite levels of performance. They form the basis for any group to be able to play their individual parts and provide a means for fitting the parts together with one another, in order create music together.

Physical gestures used between performers during performance to communicate nonverbally with one another are usually efficient, small, and subtle in nature. There are three potential reasons for this. The first two are relatively simple. 1) Musicians usually sit quite close to one another, and 2) the gestural dialect of each musician is well known between members in the group. The third reason is more complex. Small and subtle gestures help support the longer musical lines while helping to maintain an ongoing flow of nonverbal communication between players by helping to communicate sonic information about the direction and shape of the music. While accompanist and some effective gestures of professional string quartet musicians may increase in intensity when an audience is present, which may, in turn, increase the overall volume of the group, figurative gestures that musicians use to communicate nonverbally between each other generally maintain their shape, flow, and expression throughout rehearsal and performance. This is because gestures that musicians use to communicate to an audience in a large concert hall may have to be bigger than those effective and accompanist gestures used in the rehearsal room. However, there is a core element to the music’s flow and shape that will be maintained through the smaller and more efficient gestures that string quartet musicians rely on for nonverbal communication between each other.

There are many ways that gestural movement helps players coordinate their parts with one another. These include the finer details of how the left and right hands are used; spontaneous moments indicated in the score; visual cues that happen ahead of time to warn players that something different is going to happen; and finally leadership and how that impacts the use of the body. Gesture also helps define the musical roles in a string quartet. How the group interprets those roles will dictate how the group moves through a piece of music and which musical line or lines will be featured throughout the performance. Leadership can also rotate quickly around the group both in terms of movement and sound, and gesture will be used to signify these shifts. Another element that will affect the use of gesture within the group is the regularity of the pulse.
in any given piece of music. In music with a steadier pulse, player’s gestures will tend to be integrated into the ongoing groove that they feel internally. However, in music where the music starts and stops more often, cues during silence will be utilized with more frequency so that the players can synchronize their sounds. In music that is more complicated rhythmically, and also when the pulse of the music changes, players will often bob or make slight pulsations with their bodies so that everyone is able to play complicated rhythms off the same pulse or so they feel the change in pulse increase or decrease at the same rate.

Performers get to know each other’s gestural dialect over time. The development of this dialect does not necessarily involve a conscious decision to physically gesture like the other members in the group, but may be a result of quartets spending so much time together. Even so, string quartet musicians will have their own individual physical manifestations of these gestures that need to be synchronized with the group. However, the important point is that performers can anticipate and react to each other’s gestures, in order to stay attuned to the slight nuanced variations in both physical but especially sound gesture.
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Chapter 7

Conclusion

1 Communication and Interaction

This dissertation analyzed different aspects of nonverbal communication and their effects on and use in string quartet interpretation, coordination, and expression of a musical score in performance. It aimed to investigate how sound interacts with vision, movement, and breath, and also how each of these modes and channels of sensory reception of nonverbal communication interact with one another. I have argued that they overlap in many complex ways and that each one, alone and in various combinations, can augment string quartet members’ ability to obtain information from one another, supporting enhanced levels of performance. Although the integration of the modes and channels of sensory reception is important, I was interested in analyzing them separately in hopes of providing better understandings of the particularities of each one. I was also interested to see if it was possible to investigate if and when players were using them either explicitly or implicitly. While it was difficult at some points to tease apart the modes and channels of sensory reception of nonverbal communication that happen during string quartet performance, it has also been enlightening to try to do so. By trying to understand each mode and sense on its own, I was able to see their multiple dimensions, even as the importance of multiplicity and interaction in facilitating group synchronization became clearer.

When I first became serious about exploring the topic of nonverbal communication for my dissertation, it seemed as though scholars had paid relatively little attention to defining the terms communication and interaction, often using them interchangeably. I therefore spent a good deal of time investigating their similarities and differences. Exploring the meanings of these words had several benefits, not the least of which was making clear the need to better define the nature of information exchanges between performers during acts of music making.\textsuperscript{131} Despite critiques of using theoretical models culled from disciplines such as language and linguistics to understand information exchange between performers during performance, I initially chose to conduct my investigation based on one of their central constructs: the paradigm of

\textsuperscript{131} McCabe, \textit{Embodied Knowledge in Ensemble Performance}, 19.
communication. As I conducted my research, and especially during the analysis and writing stages, it became clear to me that this notion of communication was limited, as other music scholars such as McCaleb had argued. In particular, the emphasis on encoding, common in studies of communication, did not seem adequate to encompass the many different types of intentional and unintentional exchanges that take place through a number of different modes. Thus, I came to understand that key features of communication in the context of chamber music are its ongoingness and simultaneity, especially with respect to how multiple modes function to carry explicit and implicit information to channels of sensory reception. As one participant in the study pointed out, communication in a string quartet is a dialogue in which the channels of communication are always open for receiving and sending (interview with Cello String Quartet C, February, 2014). I have since refined this notion to recognize that different modes play various roles in sending information and different senses play roles in receiving information within the dialogue. Nevertheless, this informed my approach and led me to analyze the material as interactive communication in which the flow of outgoing information within the quartet is received and processed at different levels via channels of sensory reception and includes actions that are both explicit and unintentional.

Through interviews, videotape analysis, and critical reflection on my own string quartet performance, it became clear to me that (nonverbal) communication and interaction between musicians are subtle and take place at great speed. The video footage of public performances illustrated, further, that most of this inter-ensemble information exchange is unnoticed by audience members or external onlookers. Indeed, the specific meaning of the nuanced signals typically develops between string quartet members over many years of practice and performance. According to one participant, it took his group between five and seven years for their nonverbal interactions to become second nature (interview with Viola String Quartet D, November, 2013). The centrality of such nonverbal communication to elite level performance is one of the reasons that string quartets must spend so much time in rehearsal. The required sense of unity does not come easily or immediately. Rather it demands constant attention and effort moving toward an ideal defined by the members of the ensemble and those who evaluate their performances.

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McCaleb, *Embodied Knowledge in Ensemble Performance*, 44.
As I have argued throughout the dissertation, nonverbal communication is central to creating a sense of group synchrony and many of its processes and procedures require continual refining, honing, and development. This can be a challenge with respect to one piece of music. Yet the demands of professional string quartet performance are such that the constant addition of new repertoire is expected and necessary. Complicating the processes of developing a group dialect is that different kinds of pieces demand different approaches to nonverbal communication. On the other hand, the fact that certain aspects of nonverbal communication are more broadly held—for example, the use of peripheral vision and direct eye contact; the role of breath in instigating body movements and facilitating anticipatory auditory imagery; cueing during silence and signalling; and using gesture to shape and express the music—facilitate group cohesion and even allow for some degree of precision early in the performing life of an ensemble. Nevertheless, many details and idiosyncrasies about aspects of nonverbal communication must be defined and honed within each group to achieve elite status.

These many fast and subtle nonverbal processes central to cohesive string quartet performance, in addition to requiring time to develop, are also notable for the fact that they involve continuous adjustments based on anticipation (and expectation) and reaction mechanisms. This was first documented by Blum (1986) in interviews with the Guarneri String Quartet and is summarized by a quote from violist Michael Tree: “Each of us is influenced by constantly fluctuating circumstances. Every moment of our playing is conditioned by what has just occurred or by what we think is about to occur. It remains creative because just about anything can happen.”133 Today, minute timings and temporal variants are being investigated with more technological equipment, and such studies are reaching the same conclusion. As Wing et al. (2014) note, “Given the variability in asynchrony, the quartets must necessarily have made timing adjustments to maintain synchrony of ensemble.”134 In their study two professional string quartets were encouraged to introduce timing variations that demonstrated a range of expressive performance.135 Examining the effects of these variations, time series analysis provided

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135 Ibid., 8.
quantitative support for Goebl and Palmer’s (2009) suggestion of the use of “reciprocal correction” for synchronization between ensemble players.\(^{136}\) Goebl and Palmer’s concept of reciprocal correction refers to the moment-to-moment flow of the performance and all the different (although sometimes subtle) things that happen and unfold. It also helps better explain the “spontaneous musical variations,” studied by Seddon and Biasutti (2009 and 2009A) that have been so central to my work.

Nonverbal information is carried through sound (which can sometimes have tangible physical sensations), the many different facets of vision (including those which makes sensing through vision almost tangible), and facial and bodily gestures (that are visible and intelligible to other performers). As I have argued throughout the dissertation, it is through this flow of information that allows spontaneous musical variations, reciprocal corrections, and adjustments to occur. These same modes and channels of sensory reception also make it possible for the musicians to connect with one another during performance, making it pleasurable for them and their audience. Indeed, over time, intuitive bonds described as the “seventh sense,” “sensing,” or “feeling” are developed and cherished between players and my experiences as an audience member for numerous string quartet performances suggest that such ineffable connections are perceivable to listeners.

At some point during this study, I realized that I had assumed the validity of Seddon and Biasutti’s (2009A) contention that one goal of string quartet performance was to create “spontaneous musical variation.” While the pair make a strong case that this is the goal of professional string quartets, I realized that it would have been useful to query this assumption by asking the study participants about their goals in performance. Even without my asking, comments by several participants suggested strongly that different string quartets may have different goals or that they may define their goals in slightly different ways. These differences certainly could impact the ways that the musicians interact with one another during performance. When I asked about spontaneity in performance—again, with the assumption that spontaneous variation was a goal—one participant noted the importance of expectations (interview with

\(^{136}\) Wing et al., “Optimal Feedback Correction in String Quartet Synchronization,” 8. (Goebl and Palmer’s study investigated timing, head movements, finger kinematics (movements), and the effects of auditory feedback in piano duets)
Violin 2 String Quartet E, October, 2013). That is, spontaneity only makes sense in the context of pre-existing expectations that are somehow exceeded. I believe that these musical expectations are directly related to familiarity and in particular, co-performers expressive and technical musical tendencies, the piece being played, and each player’s responsibility for different roles and ability to switch between them quickly. Such expectations initially develop during rehearsal, when a group establishes a collective method (mental representation) of playing a piece and receive positive reinforcement as they develop habits or routines for its performance both in rehearsal and in concert settings. All of this, further, is related to both the musicians’ idealized notion of each piece performed and their ideals for string quartet performance more broadly. Such ideals, habits, and expectations are also related to the roles each player has been assigned, or has inherently gravitated towards, whether that is initiator, co-initiator, simultaneously supporter and initiator, or supporter.

In performance, moments of unexpected spontaneity (both positive and problematic) can be understood as those instances in which there is a difference between a player’s intended actions and movements and what actually happens. Once the actions and interactions necessary to present the group’s interpretation of the work have become second nature or a more inherent competence, however, the group can start to deviate from the norm with purpose, as a matter of making the most of spontaneity and engendering the spontaneous creativity to which Seddon and Biasutti refer as a performance ideal,

Achieving the right balance of spontaneous interaction and meticulously rehearsed coordinated action requires intense and focused effort over many years. Susanne Frank, second violinist of the Carmina String Quartet, describes how quartet members develop a “seventh” sense as a result of working together over many years: this enables them to compensate for anticipatory weaknesses mutually.\(^{137}\)

Frank’s statement resonates strongly with my own experience as a string quartet performer. I would further add that there are different levels of familiarity and comfort that my quartet experiences in regards to the specific piece we are performing. These levels are related to how many times and how frequently we have performed the specific piece over time.

\(^{137}\) Tovstiga, Odenthal, and Goerner, “Sense Making and Learning in Complex Organizations,” 228.
As I worked through this study, I began to realize that within the context of string quartet performance, the concept of anticipation is just as important as the concept of reaction in a discussion of nonverbal communication. More important than both concepts is the space in-between anticipation and reaction. Brinner discusses this point when he says, “The time gap between cue and response is one of the most distinctive characteristics of particular types of interaction. This gap is often very brief and the response seemingly instantaneous.”

The word anticipation emphasizes and includes the kind of sense of expectancy and focus that is required to successfully achieve levels of elite performance, where the gap between anticipation and reaction is indeed very brief, and responses seemingly instantaneous. Anticipation is important during performance because it is a factor of the group’s interpretation of the musical work, which has been developed and honed over many hours of rehearsal and prior performances. During these hours of rehearsal, the group develops explicit musical ideas, as well as enhancing aspects of familiarity and inference that are centred on the specifics of the musical score. However, during performance, when something unexpected happens (either intentionally or unintentionally) then the process of reaction comes to the fore, providing the players a method to stay together, either through a quick change in sound, visual cues, breath, or movement, to remain in sync with one another.

Thus, within string quartet performance, ideas of anticipation and reaction in relation to nonverbal communication are closely linked and influenced by a number of factors. These include: the style of music being played, the individual’s musical part in the score, the individual’s defined role (as initiator or responder), the individual’s seating position, characteristics of the instrument being played, and I would venture personality types (which may be saved for another study). Dealing with these unexpected moments—and, for that matter, successfully navigating the expected moments of a string quartet composition—requires an incredible amount of focus and minute adjustments during performance. However, it is a particular type of focus, whereby performers do not break down the moment-to-moment information into a series of calculations, but rather reach the much desired “flow” state of performance, as they connect with their co-performers, and the music “plays itself.”

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138 Brinner, Knowing Music, Making Music, 186.
2 Conclusions About Nonverbal Communication

By taking apart the different modes and channels of sensory reception of nonverbal communication, it is apparent that there are multiple modes functioning simultaneously being received and processed at multiple levels by the different the senses, all of which are specific and useful at different times in making audible the directives from the musical score. The concept of multi-functionality has proved most useful in explaining the various nonverbal processes that occur in string quartet performance. This is because the performer’s attention is constantly shifting within the different sub-channels of sensory reception, while also balancing between the channels themselves. Additionally the channels and sub-channels are simultaneously managing the cross-modal flow of information about their co-performers and the music being played. This concept was first referred to in chapter 4 in relation to the different types of vision that is possible for performers to use to receive information. Because different levels of visual attention coexist simultaneously in varying degrees of foreground and/or background, foregrounding peripheral vision can potentially create an increased amount of incoming visual information.139

Using peripheral vision allows performers to monitor the general movements of a number of group members simultaneously while continuing to read their score. Breath is also able to communicate information multi-dimensionally, allowing musicians to send cues about pulse and character while enhancing sound production. Gesture carries different layers of meaning of the shape and flow of music, as the sound is realized through different types of movement that members are also able to connect with visually.

The different modes and channels of sensory reception of nonverbal communication are inter-related and inter-dependent as is demonstrated by the fact that each chapter necessarily addressed at least one of the other modes or channels of sensory reception, while every chapter addressed sound. Through this study we have seen how many performers understand the relationship between incoming information received from sonic and visual senses as on a spectrum, where members are conscious of how much they think they are relying on one or the other. Breath is used to instigate body gesture and cueing, and therefore is closely related to anticipatory auditory

imagery as players hear in their mind what sounds they will create during performance. Breath can also be heard, and be used to provide an auditory ictus of a tempo or pulse, along with a bodily cue or gesture. Finally both large and small motions are made to create figurative gestures. Co-performers can use both the visual and sonic senses to connect and understand gestures that their colleagues are making, in order to imitate the same movements, complement the gesture, or physically or sonically contradict the action that is unfolding. The ability to communicate in this way gives performers opportunities to make the music conversational. This study makes clear that nonverbal communication becomes more efficient and automatic with familiarity of both group members and specific pieces of music, as was demonstrated in each chapter that addressed different aspects of nonverbal communication. Groups have developed their own “dialects” of gesture, and found ways that breath and visual contact is used to be of the utmost benefit in aiding the group’s sonic goals.

3 Implications

The topic of nonverbal communication in string quartet performance is neglected in musical education and quartet training. This is partly because it is a very difficult subject to address verbally, as so many processes are carried out implicitly and are tightly integrated with one another. However, it would be helpful for teachers to know how to better address these processes directly, or in the least, to be able to ask a student which mode or channel of sensory reception they are focused on at any particular point. It is possible that a shift in focus to a different sense of nonverbal communication or a shift to a different sub-channel within the sense could help solve ensemble problems by simply shifting the student’s perspective. Addressing the different modes and their relationships to one another would also provide an increased understanding about the ways that these modes overlap and influence one another and how students can use them most beneficially to communicate outgoing information to the group. Recognizing that modes and senses can function both implicitly and explicitly in the flow of information would also help string quartets achieve higher levels of unity.

In addition, having students practice their use of peripheral vision will help them manage multiple levels of cognitive functioning while staying connected with the group. An awareness of when visual information is overtaking audio information or when incoming visual information is not being used effectively to help coordinate sonic information is a significant factor in
contributing to young groups’ improvement. It is important that the use of breath within the group is addressed continuously, and also that students are taught to make it representative of their musical intentions. Addressing the concepts of technique and gesture together would help groups connect more closely to meaning of the music, while providing a method of being able to execute difficult musical passages. Also important is the significant role the bow has in both sound and physical gesture. All of these elements will aid in improving a group’s ability to communicate and interact with each other in the moment of performance.

4 Future Research

This study attempts to begin the investigation into the wonderful, yet mysterious ways in which a string quartet operates musically, from the perspective of nonverbal communication. However, there are many matters that were not addressed and others that were only addressed briefly. Further research on the use of visual contact could include a more detailed study of exactly where string quartet members look, when, and why. It would also be enlightening to study the use of vision through a more quantitative means; for example when chamber musicians are using focused vision or peripheral vision, a combination of the two, or switching very quickly between the sub-channels. Of course it would be important to study the relationship of different uses of vision to the perception of sound, and the different ways people hear themselves and/or the collective group sound. Further research on breath could include in-depth studies on how members coordinate their own breath with that of the group, and the effects of different kinds and lengths that inhale and exhale breaths have on phrase length and/or tempo. Further research on gesture could include: 1) how string quartet members speak among themselves about gesture, and the kinds of impact it makes on players’ performances, 2) how the use of gesture develops with familiarity of players and also with the repertoire being played. One question that is difficult to answer is: if the players in a string quartet were able to move even more similarly to one another (than they do already) would the group’s playing “sound” be more matched or more convincing (especially to members of the group, if those indeed are a string quartet’s goals)? If this were the case, would it be beneficial for groups to undergo some movement training together? To what extent does this implicitly and naturally happen over time? Does it happen more to particular groups? Is the ultimate difference between ad hoc groups composed of very good players and dedicated string quartets solely dependent on the amount of time that they spend together (after controlling for important variables such as performance abilities and
musical understanding)? It would also be interesting to study a string quartet over several years at the point when a new member joins the group. Further research on broader concepts of nonverbal communication could include how various levels of attunement are related to the development of implicit and explicit processes of music making either in the context of rehearsal or performance. While many of my suggestions focus on the interactions that happen between performers, this research could extend to questions of audience-perception impact and reception. It is my desire that this thesis will inspire other researchers to investigate the many complex ways those involved in string quartet performances relate to one another as they see, hear, and perform the creation of this transcendent, glorious music.
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Appendices

1 Appendix 1: Video Analysis of the Cecilia String Quartet

1.1 Introduction

This video analysis is of a performance of my own group, the Cecilia String Quartet (see Video 8, page 163), playing the opening 30 bars of Haydn String Quartet Op. 20 No. 4 in D Major (see Figure 8, page 162-63). This was our first performance of this work in a concert hall. For this analysis, I was able to collect feedback from my colleagues two times, once about a week after we performed the piece, and then again in summer 2014, when I had completed my initial analysis, at which point they could agree or disagree with what I had written.

Based on several viewings of the video, I describe the relationship between the musicians’ nonverbal communication and the musical score as well as other instances of interest with respect to coordination of interpretation and intention. Analyzing a video of my own group allows me to compare the goals of the group (as I understand them) with what I see and hear from a more distanced observer’s perspective such as listening to a recording or watching a performance of another ensemble. I am also able to compare my individual goals and intentions with those of the other individuals and the group as they explained them to me in interviews. Finally, I am also able to observe and evaluate my own performance within the group with respect to how synchronized I am with the other musicians, and my contribution to the realization of the group’s musical goals. I include all characteristics of nonverbal communication that are relevant to the coordination and integration of the four different parts of the score at any given moment.

1.2 Specific Moment-to-Moment Analysis

Violin 1 and Viola both move their chairs closer into the group before we begin. Close physical proximity can be helpful for the musicians for coordination of sound, movement, and gesture. Violin 2, Viola, and Cello all look at Violin 1, who does not return any of the glances, before we begin to play. It was decided during the rehearsal that Violin 1 has been “appointed” to initiate the beginning of this movement:
So we do this thing in our group where, someone might be the initiator or leader, but then, everyone actually does the same gesture, they just begin it when the person says to initiate, so, Violin 1, initiates … (interview with Cello Cecilia String Quartet)

In this performance (and in general) Violin 1 does not immediately prepare or look directly at any of the other players as she told me that she wants everyone to be able to get ready in their own time (interview with Violin 1 Cecilia String Quartet). She has situated the other members in her peripheral vision, and can “sense” that the other members are ready. In this particular example, Violin 1 consciously waits until everyone has looked at her and feels that everyone is ready. She actually looks at her own bow to prolong this stage, and then when it is in the correct place to play her violin, she initiates the cue to begin the movement.

1.2.1 Starting the Movement

To cue the beginning of this movement, which is in 3/4, Violin 1 gives a full bar cue with a circular motion of her upper body. This motion also moves her violin, which, starting from a neutral (middle) position, comes up and down (past the neutral position) back to the neutral position again. After bringing the bow to the place of correct contact with the string, her right arm stays with the motion of the violin. The cue consists of the length of three quarter notes all in one breath. She uses a smaller subdivision of circular upper body and right arm motion on the third beat to ensure that we would really start together. For the whole first bar in this movement, we all play the same note, D, in different octaves. The score indicates three quarter notes, all under a slur with staccato markings. This opening motive reoccurs often throughout the movement, so it is significant to the performance and was, for this and other reasons, a point of focus during rehearsal.

While preparing for the performance, we had some difficulties with this phrase. In particular, we found it difficult to start exactly together. There are a few reasons for this. One reason is the general challenge of beginning pieces among many string quartets, which I have also noticed from my experience playing in and coaching other ensembles. Another reason is particular to this movement. Usually string players start musical passages on a down-bow. However, we decided to start this piece on an up-bow, as we feel that the first bar of this piece sounds like a pick-up to the second bar. Essentially we feel that the first bar leads to the second bar. It is easier to create this musical sense or feeling of leading to the next bar by playing an up-bow and then a down-
bow. One explanation for this is that the frog or bottom of the bow is heavier than the tip making it easier to play with increased volume towards the frog of the bow. However, beginning the onset of a note on an up-bow is more difficult than starting down-bow. There is less control at the tip of the bow as it is farther away from where the right hand is holding. Also the motion of starting up-bow is more awkward than starting down-bow, especially for violinists and violists, as this motion is going against gravity.

The control challenges related to the specific demands of this movement are exacerbated by other problems that are more inherent to string quartet performance. At the beginning of any piece, there is no pulse established before the initial cue. Even though we all know the general tempo, the musicians might imagine the tempo somewhat differently. The cue is usually a fairly quick motion, meaning that the group has to synchronize around it very quickly. The rest of the group will interpret the initiator’s movements and react with their own version of the motion to coordinate the beginning sound of the movement. Depending on the duration or length of the cue, all of this transfer of information happens in less than a second. The highly coordinated standards string quartets hold themselves to require members to account for even the slightest of variation in cue in order for the beginning sound to be as precisely coordinated as possible.

When I slowed the video down to analyze how each of us embody the starting cue, Viola (me) and Cello made the same movement as Violin 1. This consists of a large, circular movement made with the upper body to signal the whole bar, and a smaller loop for the third beat. Violin 1 made the largest movements, and Viola makes moderately smaller movements. Cello embodied the smallest movement in this particular case, which she mostly did with her bow arm. Violin 2, on the other hand, did not move with the initial impulse of the cue made by Violin 1. After viewing the videoed performance a week later Violin 2 commented,

So she did quite a big expressive cue, and actually I didn’t cue as much as I thought I do. I just kind of made a small motion to catch the wave of her cue right after. (interview with Violin 2 Cecilia String Quartet)

Later on I confirmed with Violin 2 that this is because she sits directly beside Violin 1 and can easily see and feel the wave-like gesture she makes. However, she also told me that the ability to play easily together with Violin 1 has to do with the quality of the cue and the familiarity that has developed between them as players. In this particular example, Violin 2 ended up reacting to the motion of the cue as soon as the sound began, moving her upper body simultaneously with
Violin 1. In this mini-phrase, Violin 2 plays a countermelody that parallels and harmonizes Violin 1’s melody. Even though we all carried out the cueing gesture differently, the onset of the beginning note began at the same time (which could be easily argued as the most important aspect). When the sound begins, the upward swing of the body actually continues, coming down again for the second bar of the piece. This is because we agreed that we wanted to have the first bar of the piece feel like an upbeat to the second bar.

1.2.2 Into the Movement

Within the opening passage there are five mini-phases that consist of six bars each. For the first two mini-phrases Violin 1 and Violin 2 move in the most similar manner of all the players. Being right next to each other, and playing the same instrument, it is easy to emulate the swaying motion of the other person. I call this the “tree” effect, in the way that trees sway in the wind together. The wind in this case is a combination of pulse, phrase shape, and emphasis. This effect generally occurs when two or more players sitting next to each other are playing similar or the same musical material on instruments that use similar techniques. This is usually a result of players being attuned to one another, but not required of players in order to synchronize with one another. As a violist sitting on the outside of our group, my ability to make the tree effect with my violin colleagues is limited, even though we all hold our instruments in the same way. This is because I sit directly opposite from the two violins, making my movements the reverse of theirs.

Throughout this excerpt, Viola and Cello tend to move less than the violinists, especially toward the end of each mini-phrase. This is because Viola and Cello are still playing the same pitch as they were in the beginning, with quarter note subdivisions in the last bar, whereas Violin 1 and Violin 2 are more active towards the end of the mini-phrase, playing sixteenth notes together in thirds on the third beat of the fifth bar. Additionally they have a more active melodic contour especially from the third bar and onward.

The fourth mini-phrase starts on an E, a pitch different from the first three, which start on D. We decided to play this one with the loudest dynamic and most forward energy. Subsequently we are all moving more before and during this fourth mini-phrase. In preparation for this phrase there is an audible breath and all of us lean into the group with Cello moving in and sideways. Then we all lean back again. This mini-phrase also ends in a deceptive cadence, which is a cadence that unexpectedly does not resolve. In this performance we do not achieve a good sonic balance on
this chord. It is because in our efforts to make it a surprise we keep up the volume of the sound until the very end of the fifth bar. As a result, the overlapping resonant sound at the end of the fifth bar swallows the notes of the deceptive cadence on the sixth bar. Also, some of us make a small sonic space between the fifth and sixth bars and other players do not, making the ensemble of the deceptive chord unmatched on the sixth bar. However, we had previously planned and agreed to make this deceptive chord a surprise, so we aimed to play in a committed manner all the way up until its onset. During rehearsal we had some trouble executing this musical idea simultaneously in a way that was satisfactory and convincing to each of us. Our body language or movements right before the deceptive cadence are quite similar to the movements all of us use at the cadences of all the other mini-phrases. So the commitment to the end of this phrase is revealed mostly through our sound. Unfortunately the execution of this phrase was not effective because of a voicing imbalance.

When I asked my colleagues about this point, Violin 2 agreed with me. Cello thought our movements before the deceptive cadence were smoother than the other mini-cadences and agreed the deceptive cadence did not work, but for the reason that the chord is a bit soft and short so it is hard to hear. Violin 1 agreed that our movements were similar to the other cadences, but thought that the actual cadence sounded “half-way” (or not fully convinced) probably because we had not agreed on how to play it, and we had rehearsed it too much (Violin 2 and Cello Cecilia String Quartet, email correspondence to author; interview with Violin 1 Cecilia String Quartet).

The fifth and last mini-phrase is really interesting. Going into it, Violin 1 cues with a motion that ends up in a lower position than she began the initiation of the cue. Violin 1 told me that this was not done consciously. Usually the body movement of a cue will be either upwards with a downward release or downwards with an upward release, allowing one to return to the position or place where they began the cue. Violin 2, on the other hand, does not cue or move before this mini-phrase. Instead, she maintains a lower body position, which is the body position she moved into toward the end of the fourth mini-phrase. So both violinists are in lowered body positions for the beginning of the fifth mini-phrase. Similar to Violin 2, neither Viola nor Cello cue during the silence before the fifth mini-phrase. They are both still throughout this mini-phrase. In the second bar, Violin 2 makes a very expressive but small gesture with her upper body motioning inwards towards the group then quickly retracts her upper body. This gesture reflects the melodic contour of what Violin 1 and Violin 2 are playing—a half note followed by a lower (in pitch)
quarter note. The effect is that the sonic and visual character of what she is doing is somewhat pleading. In the next bar, Violin 1 emphasizes the three quarter note motive amidst stillness, highlighting it with small circular swoopy motions of her upper body. Violin 2 and Cello also emphasize the three notes that they play by moving their upper bodies slightly horizontally with each note. This is because this is the first time that the opening motive of three quarter notes is repeated by all four of us. In contrast to the violinists, however, I am quite still all the way through this mini-phrase and do not highlight any of the bars or notes gesturally or sonically.

Even though the violinists do move during this phrase, which is marked in the score as the quietest of this passage, it is notable that collectively our movements are the smallest of the five mini-phrases. In making this phrase the quietest, Viola and Cello imbued the moment with stillness as well, so we are very still throughout it, with me not moving at all. I had a slightly different understanding of the group’s collective interpretation of the amount of physical and aural movement this mini-phrase encompassed. Because the group had preplanned the amount of motion at this point in the passage, I did not pay as much attention to what was actually happening during the performance. I just assumed that I was doing the same thing as everyone else. On reflection, it is clear that I had understood a different interpretation of this particular phrase than the rest of the group, especially in relation to how much physical and aural motion it contained. Although our bodies’ movements attest to our slightly different interpretations of this particular phrase, with me being the most different, our various performances of it do not sound dramatically different. The four parts are quite similar for the first three bars of this mini-phrase, but in the last three bars Violin 1 and Violin 2 come down melodically as they approach the cadence, while Viola and Cello raise melodically up to the cadence. However, toward the end of this mini-phrase, Viola and Cello are too quiet and it is difficult to hear those parts. Cello raises her eyes towards the ceiling reflecting the melodic contour of her notes, which go upwards, towards the end of this final cadence. She then looks towards Violin 1 for the cue to the next section. Viola, on the other hand, looks up after the phrase has finished towards Violin 2 for the cue for the next section.

1.3 General Movement Analysis

Violin 1 and Violin 2 move with a kind of a circular upper body motion throughout much of this passage. This consists of rotation from the waist up, involving a combination of both horizontal
and vertical movements. Often it reflects the character and melodic contour of what they are playing. These movements are in time with the pulse as well, but do not reflect every impulse of the metre. This is effective for coordinating the motion and inflection of the music, especially when they are playing the same material. In addition, it helps coordinate ensemble. The pulse of the movement is in a big one with smaller subdivisions of three, similar to a fast waltz. Violin 2 noted that,

I thought that me and Violin 1 do a lot of that upper body stuff, and especially through the sound, and I thought in the middle of things Violin 1 and I move a lot more, and we sort of do that rotating upper body thing, especially at the end of notes. I don’t know if that’s because we’re trying to do the next note together on a long note or something, but yeah we definitely do it more throughout the music. (interview with Violin 2 Cecilia String Quartet)

The movements of Cello are in general smaller but varied, as sometimes she moves more with the melodic line and less with the motion of playing her instrument or her own part. Although she does not know exactly what she is responding to, the cellist confirmed when I asked her, that it is entirely possible that what is happening is that she is hearing the melody played strongly in her head and reacting to the shapes of the melody. The cellist commented that,

I look a little bit different from everyone, but I don’t know if that’s because I play the cello. And also, my gestures are a little smaller; it could be that I can’t sway as much, because my instrument gets affected by my leg position, whereas that’s not the case for upper strings. But I would still say for the most part that my gestures are matched, they are my own version, but they’re in the same rhythm and communicate the same shapes. (interview with Cello Cecilia String Quartet)

1.4 General Eyebrow Analysis

In viewing the video it became clear that Violin 2 and Cello use their eyebrows in a similar manner. For example, at several moments in which there is more harmonic tension in the phrase the position of their eyebrows is relatively lower/more furrowed. When phrases resolve, in contrast, their eyebrows tend to be in either a more neutral position or slightly higher. Their eyebrows are in an even position, but in an expectant manner if there is a bit of a surprise or the music itself is reacting to something new. However, Cello told me that her mind is a little bit ahead of where she is in the music, anticipating how she is going to feel in any particular passage, and that her eyebrows subsequently reflect this internal realization (interview with Cello Cecilia String Quartet).
Both musicians’ eyebrows are quite similar in these ways, with a few exceptions, for the first three mini-phrases. In the first mini-phrase their eyebrows start up and Cello furrows her eyebrows on the third bar at the moment where everyone moves off the unison note and plays notes of a chord with more tension. In this third bar, Violin 1 has the seventh of a $V^7$ chord, creating a tritone between the two violins, which resolves briefly for just one beat on the fourth bar to the I chord. Violin 2, on the other hand, quickly furrows her eyebrows in the second bar (perhaps in anticipation of the tense chord), and in the third bar her eyebrows come up to a higher position (perhaps in anticipating of the brief resolution on the fourth bar). For the fourth bar their eyebrows then are slightly raised for Cello and slightly lower but neutral position for Violin 2, remaining this way for the rest of the mini-phrase as it finally totally cadences in the sixth bar. When I asked Cello about this, she told me that her raised eyebrow position during the fourth bar was not actually reflective of that brief resolution, but anticipating the more final resolution on the sixth bar (interview with Cello Cecilia String Quartet). When I asked Violin 2 about this, she said that it could be true, but that she is not really aware of what her eyebrows do in performance. She said that she thought that her eyebrows hold a lot of tension and nervousness when she is playing, manifesting the fact that she is stressed and trying to focus (Violin 2 Cecilia String Quartet, email message to author).

For the second and third mini-phrases their eyebrows actually start in a downward place, even though it is the same material and pitch as the first mini-phrase. However, the characters of the second and third mini-phrases are different than that of the first. In the second mini-phrase, the third bar is a G major chord in second inversion, but the melodic contour of Violin 1’s part goes down, making all four voices closer in register and subsequently slightly darker than the third bar of the first mini-phrase. The third mini-phrase is exactly the same as the first mini-phrase, but the context of it is different, because we have previously heard two versions of the mini-phrase. Perhaps this is also more of an interpretative choice that we make it slightly more brooding. Towards the end of both mini-phrases both musicians’ eyebrows go up again. Violin 2 eyebrows go to more of a neutral position, while Cello’s eyebrows go to a raised position.

While there is a great degree of similarity in eyebrow movement between Cello and Violin 2 for the first three phrases, it is notable that, at the beginning of the fourth and fifth mini-phrases, they move their eyebrows in exactly opposite ways. Both situations are explainable. The fourth mini-phrase starts on the octave unison note E for both players rather than D. Violin 2 responds to this
raise in pitch, lifting her eyebrows. However, we also play this mini-phrase at a louder dynamic and with more motion and energy throughout the sound. Cello is responding to this increase in volume and motion by lowering her eyebrows. She also told me that she thinks she kept her eyebrows in a lower place for a longer time (until the fifth bar), in order that the “surprise” resolution of the deceptive cadence would not be revealed. In the fifth mini-phrase, Cello responds to the lessening in dynamic by raising her eyebrows (interview with Cello Cecilia String Quartet). However, Violin 2 lowers her eyebrows for the first bar, because in the second bar her eyebrows accompany the expressive gesture she makes that reflects the melodic contour of her part, by going up and then quickly down again. According to this analysis Cello is in general responding to the dynamic of these particular two mini-phrases, whereas Violin 2 is responding to the intended character of each mini-phrase.

This is the first time that I have done and even really considered an eyebrow analysis. It is unfortunate that I was unable to see clearly the eyebrows and facial expressions of Violin 1 and Viola. This information is possibly a transparent reflection of expressive intent, but I feel that it is hard to realize exactly which musical expressive element (harmony, dynamic, melodic contour) the eyebrows are expressing at any given moment. As I demonstrated there are multiple different ways to interpret the reasons behind eyebrow movement. It is reasonable to say that these movements are connected to some expressive change or element in the music, but it is hard to realize when these movements are either reflective of anticipatory auditory imagery or responding to musical events. The other reason it is difficult to interpret eyebrow movements is found in my colleagues’ answers to questions bearing on eyebrow movement analysis. It is apparent that while Violin 2 is not aware of how she is using her eyebrows, Cello is able to explain some of the reasons for her eyebrow movements. However, they certainly are not moving their eyebrows in any conscious manner.

1.5 Analyzing One’s Own Performance

Often my personal experience of the performance differs from the impressions I have when watching or listening back to a recording. Listening back after the performance is slightly more objective for two reasons: 1) often in performance one’s physiological state is heightened in such a way that decreases critical perception of the performance, and 2) during performance ideally one is listening actively in the immediate present and future sounds, and not to what has just
passed\textsuperscript{140} Even after many years of practice and performance, I still feel that my intentions are quite different from the result. I can think that I am “doing” something, but in reality I am not. During ensemble performance, it is one thing to be able to respond to what your co-performers are doing, whether they are doing it intentionally or not, and it is another to have an objective perspective about what you are actually doing. As McCaleb points out, “intention does not change an action’s existence.”\textsuperscript{141} In some sense, I think it is easier to respond to my co-performers intentional or unintentional actions than to have an objective realization of my own actions and contributions. In fact, in rehearsal if the results of any particular expression are not coming through, we will often ask each other, “what are you intending to do there?” This is to check if it is a lack of awareness about the expression or if intentions are in place but not yielding the intended results. Intention and awareness can have a big impact on the kinds of nonverbal information performers are receiving or giving at any particular point. Therefore, realizing or being critically aware of what you are doing both individually and in relation to everyone else is a vital part of elite performance.

1.6 Conclusion

Besides the examples observed above about individuals’ discrepancies between action and effect, I also observed that it looked like we were sitting farther apart than I felt we were when performing. How closely a group sits to one another can affect how well the members hear and see each other and also how well the group is able to connect to each other’s cues, gestures, and movements. It is easier to hear and “feel” people when they are positioned more closely to one another.

While much of the discussion above focuses on questions of synchrony of movement and the musicians’ gestural responses to the directives in the score and the sounds they intend to produce as a result of their interpretations, I have not addressed a more basic question: if this string quartet was moving more similarly, in passages where we have similar musical material, would they appear more together or unified to the audience? Although beyond the scope of this

\textsuperscript{140} McCaleb, \textit{Embodied Knowledge in Ensemble Performance}, 79

\textsuperscript{141} Ibid.
investigation, it is nonetheless a very interesting question. A number of studies have shown that many people in the audience “listen” with their eyes (Schutz, 2009; Wanderley and Vines, 2006; Davidson, 1993). To what extent is this true for ensemble musicians as well? As Violin 1 of this group told me,

If we watched this [video] and Violin 2 and I were maybe moving apart, and you guys (Viola and Cello) were moving in opposite ways, it would look like it’s maybe like we were not agreeing on how it’s supposed to sound, and it would just sound like a big disagreement. (interview with Violin 1 Cecilia String Quartet)

Another question for performers may be is it important to be aware of which gestures are used in preparation (or in a more prescriptive fashion) as opposed to responsive gestures? Is this connected to how performers are listening either in the moment, ahead, or behind when they are performing? Either case could be applied in relation to other players and the musical score. However for more specific gestures, where all the musical parts are exactly the same, performers appear to have their own idiosyncratic manifestations of particular movements, and yet sonically the ensemble is still matched. It appears that sonic and subsequently visual discrepancies arise more when these experienced performers either 1) have different mental conceptions of the previously agreed musical interpretation, or 2) are not attuned with the group in the moment.
Figure 8. Haydn String Quartet Op. 20 No. 4 in D Major, 1st movement, bars 1-30.

Video 8. CSQ Video Analysis  https://youtu.be/rgi3TnLQpLA
2  Appendix 2: Interview Questions

Background:

Who are your most influential teachers or mentors? Did you feel that you learned to emulate their way of playing or gestures at all? Do you feel that you got any of your playing traits from them?

General:

What are all the characteristics of nonverbal communication shared by the string quartets during performance? What are some of the characteristics that you feel are shared by your group in performance? (What are some of the tools that you use to communicate with your colleagues while you are on stage?) Which is most important to you? How are they important?

How is nonverbal communication and/or gesture used to enhance coordination and expression between string quartet members during performance?

How is nonverbal communication and/or gesture used to facilitate spontaneity in string quartet performance?

How is it used to facilitate synchronization?

Particular:

How does each member use nonverbal communication or gesture differently?

How do different halls impact your use of gesture or nonverbal communication?

What do you think of the seating configuration? What are the gestural challenges that you face based on where you sit?

Do you find yourself intentionally creating gestures or reacting to gesture more often? Or neither?

Is there a difference between the way violinists, violists, and cellists use gesture? Do you find or feel that you use nonverbal communication or gesture differently because you play cello?
How is nonverbal communication and/or gesture affected by 1) the piece or style of the piece? 2) familiarity of group members and with the music?

Do string quartet musicians’ gestures change over time to mimic each others’ gestures?

How do all four string quartet musicians communicate simultaneously? How is leadership negotiated through nonverbal communication?

When you say you cannot hear one of the other members in the group, do you rely on visual cues more?

Would you agree that there are four different channels of nonverbal communication? How do the different channels relate to each other? What distinctions are there?

Is aural nonverbal communication in a different category than body movements? Does aural communication correspond with the gesture communication and breathing communication?

How important is it to have really similar bow arms? How important for articulation? How important for release?

How important is it to match gestures on a regular basis? For different parts of the score? (e.g., beginning and end, accents, musical climaxes, imitation, entries, to forewarn something unexpected) Do you use gesture to coordinate intonation, balance, intensity of sound, vibrato, and/or articulations?

How have your movements changed since you joined?