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Co-Performer Empathy in Expert Ensemble Playing

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CO-PERFORMER EMPATHY IN EXPERT ENSEMBLE PLAYING

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ABSTRACT: This thesis, comprising four empirical studies, investigates the process of co-performer empathy in expert ensemble playing. Following an extensive review of the existing literature relating to both optimal experiences of performance and empathy, it begins by probing the relationship between ensemble musicians' optimal experiences of performance and their experiences of co-performer empathy through a series of focus group interviews. In addition to co-performer empathy, spontaneous interpretative flexibility (SIF) in performance is identified to be a central feature of optimal experiences of expert ensemble performance. Through observational case studies, involving video-recall, acoustic analyses, and heart-rate measures, a model of process of co-performer empathy and the related process of SIF is constructed. The final model shows co-performer empathy to be a cyclical process grounded in a pre-requisite shared approach, both to the music and to working together. It is often characterised by a special connection between players. It involves the identification of a co-performer's expressive intention, followed by an appropriate expressive response. Co-performer empathy appears to be a context-specific form of musical empathy that emerges as a group process during ensemble playing, and does not seem to be directly related to trait empathy. Finally, from the findings of these empirical studies, potential techniques for strengthening co-performer empathy and the production of SIF in ensemble playing are proposed.

KEYWORDS: e*mpathy, ensemble playing, music performance, optimal experience, creativity*

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INTRODUCTION

0.1 RESEARCH RATIONALE

The psychology of optimal experience has received considerable research attention in the post-war years as researchers have sought to understand what makes us happy, and how we can be happier. A number of frameworks examining optimal experiences have been developed, including peak experience (Maslow, 1959), flow theory (Csikszentmihalyi, 1975), and peak performance (Privette, 1981). There are a small number of studies on optimal experiences in music performance, including Gabrielsson's seminal SEM project (2001), which specifically explored people's "strongest experiences of music" in the contexts of both listening and performing. However, despite studies agreeing that optimal experiences of music performance are important, desirable, and motivating for musicians, there is very little research in this area that is specific to ensemble playing.

Ensemble playing is an important area of music psychology research, because almost all musicians rehearse and perform music with others at one time or another in orchestras, choirs, and small ensembles. Since music performance is often an ensemble activity, and musicians' experiences of peak performance have been shown to be important and desirable, it is surprising that few existing studies have specifically addressed experiences of peak performance in the context of ensemble rather than solo performance. A fundamental difference between solo and ensemble experiences of performance is that ensemble performance involves social and musical interaction between co-performers. It seems likely, therefore, that these interactions will influence ensemble musicians' peak performance experiences.

In recent studies exploring chamber musicians' optimal experiences of performing together, players have spoken of achieving a collective state of mind, described variously as "striking a groove" (Berliner, 1994), a "group flow state" (Sawyer, 2006), and "empathetic attunement" (Seddon, 2005). This collective state of mind seems to be the key difference between solo and ensemble optimal experiences of performance and is likely to be linked to empathy – a relatively recent intellectual concept (Vischer, 1873/1994). Lipps (1903) introduced the concept of *Einfühlung* (literally "feeling into") to describe the process of inner imitation or resonance. *Einfühlung* was translated into English as "empathy" (Titchener, 1909). Over the last

few decades, empathy has received considerable research attention as a means of understanding a range of psychological phenomena and is fast drawing attention within music psychology. Studies have examined empathy in relation to cooperative music-making and intercultural understanding (Laurence, 2008), musical group interaction (Rabinowitch, Cross, & Burnard, 2013), the learning of popular and jazz musicians (Green, 2002; Seddon, 2005), and perceived expression in music performance (Wöllner, 2012).

In the area of empathy and performance, Myers and White (2012) recently explored the role of empathy in the performing experiences of nine professional musicians. Although the study did not specifically examine co-performer empathy, participants described co-performer empathy as an essential part of performing well together. More recently, Haddon and Hutchinson (in press) have explored the role and function of empathy in piano duet rehearsal. The researchers found that empathy was an important facilitative tool in the construction of shared concerns, reinforcing the duo partnership, pre-emptive conflict resolution, and creating a "safe space." The findings of this study strengthen Myer's and White's suggestion that empathy is important for musicians to be able to work together at the highest level over a period of time.

0.2 RESEARCH PROBLEM AND MOTIVATION

These studies suggest that empathy plays a key role in the working processes of ensemble musicians and may be central to our understanding of social and musical interaction within performing ensembles. However, the role of co-performer empathy in ensemble performance and its potential connection to ensemble musicians' peak performance experiences has yet to be investigated. Since optimal (or peak) experiences of music performance are important and desirable, research exploring these experiences in ensemble playing is required. If co-performer empathy is important for the long-term functioning of an ensemble and may be related to ensemble musicians' peak performance experiences, then developing an understanding of co-performer empathy in ensemble playing is essential. In order to obtain a fuller understanding, a definition for co-performer empathy in the context of ensemble playing should be developed, its underlying factors identified, and the process of co-performer empathy during performance modelled. As an active chamber ensemble musician myself, I have experienced optimal experiences of ensemble performance first hand and have a

personal interest in the findings of this research.

One of my most memorable ensemble performances took place during a competition at the Queen Elizabeth Hall in London with my woodwind trio. We performed an entire 15-minute programme from memory – an unusual performance choice for a classical chamber ensemble. During the performance I experienced a sense of exceptional collective focus and open communication with my two colleagues. It felt as though we were perfectly in sync, almost as though we were in each others' heads. When we left the stage I was swept up in a sense of euphoria. In the dressing room afterwards, I discussed my experience with my colleagues. We all agreed that our performance had exceeded our expectations, and they were both experiencing a similar euphoria. Interestingly, however, through our discussion we realised that although we recalled several of the same moments within the music that we had felt particularly "as one," there were also examples of moments where one of us had felt this and the other two had not. This personal experience, one of only a few, has motivated my interest in ensemble musicians' optimal experiences of performance, and their musical interaction during performance.

0.3 RESEARCH AIM AND OBJECTIVES

The aim of this thesis is to examine co-performer empathy and its relationship to peak performing experiences in small ensemble playing. There is no research that examines this relationship at present, and the research that does exist on optimal experiences of ensemble performance is mostly in jazz and improvised music. Indeed, processes such as co-performer empathy are likely to be more easily recognisable in improvised music, because performers have more freedom and, unlike classical musicians, are not bound by the musical score. The present research will focus on Western Art ensembles, so as to extend research in this domain. Classical ensembles provide different methodological challenges, not least in terms of how co-performer empathy might be measured. These methodological considerations will be explored in detail later.

There are five main objectives for this research:

1. To construct a model of the relationship between optimal experiences of performance and co-performer empathy

2. To identify components of co-performer empathy
3. To develop a definition for co-performer empathy in ensemble playing
4. To construct a model of the process of co-performer empathy
5. To consider potential techniques for developing co-performer empathy in student ensembles

0.4 THESIS OUTLINE

This thesis will be divided into two parts. Part I will begin with a comprehensive review of the relevant existing literature on optimal experience (Chapter 1) and empathy research (Chapter 2), and will examine this literature in relation to music performance and ensemble playing specifically. Part II will begin with a consideration of the epistemological, methodological, and ethical issues relating to the research reported here (Chapter 3), and will describe the design and methods of this research. The four empirical studies that comprise this thesis will then be reported (Chapters 4–7). Finally, the findings of these studies will be considered in relation to the overall research aim and objectives of the thesis, and the implications for the broader contexts of music education and ensemble performance will be discussed (Chapter 8).

PART I: CONTEXTS

CHAPTER 1. OPTIMAL EXPERIENCE RESEARCH

The first part of this literature review shall examine existing research in optimal experiences of music performance. The general term "optimal experience" will be used for the purpose of this thesis to encompass the various strands of research in this field of study. This review will begin with an overview of four frameworks for optimal experience: peak experience (Maslow, 1959), peak performance (Privette & Landsman, 1981), flow theory (Csikszentmihalyi, 1975), and Strong Experiences of Music (SEM; Gabrielsson, 2001). It will describe the key terms, concepts and areas of research relating to optimal human experiences that have emerged over the last several decades. Specific work relating to optimal experiences of music performance in general, and then ensemble performance in particular within each of these frameworks will then be examined in detail.

1.1 PEAK EXPERIENCE

Research into optimal experience has attracted much attention over the last few decades. Interest began in the post-war years as researchers sought to understand the "science" of happiness. Optimal experience research began with the work of Maslow (1959), whose notion of "peak experience" was defined as "moments of highest happiness and fulfilment." During the many years he dedicated to studying peak experiences, he questioned people about the wonderful, most ecstatic experiences of their lives. Participants were asked to describe the "most wonderful experience of your life; happiest moments, ecstatic moments, moments of rapture, perhaps from being in love, or from listening to music, or suddenly 'being hit' by a book or a painting, or from some great creative moment." Maslow analysed around 190 written, and 80 oral accounts of people's peak experiences (Maslow, 1971).

Peak experiences are never negative or unpleasant. They are characterised by a sensation of disorientation in time; a loss of fear, anxiety, doubt, defence, and inhibition; feelings of happiness and well-being; a feeling that everything can be done with unusual ease and lack of effort. Peak experiences have been found to result in a more positive view of oneself, other people, and the world, and a sense that life is worth living. They are the absolute opposite of everyday experiences. They are rare and not easily

forgotten. They are also unpredictable, non-volitional, and cannot be guaranteed (Maslow, 1971). Maslow's work laid the foundations for future research in optimal experience.

Panzarella (1980) specifically examined peak experiences relating to art and music. He analysed accounts of peak experiences, most of which were given by artists or musicians. His analysis found four major dimensions of peak experiences relating to art:

1. Renewal ecstasy: an altered perception of the world and a desire to create more art.
2. Motor-sensory ecstasy: physiological responses.
3. Withdrawal ecstasy: descriptions of everything disappearing apart from the object of the peak experience.
4. Fusion-emotional ecstasy: in which the experience merges with the object of the experience.

Rather than using the term "peak experience," Panzarella referred to these optimal experiences as "joyous experiences."

1.2 PEAK PERFORMANCE

The construct of "peak performance" builds upon and is intimately related to Maslow's notion of peak experience (Thornton et al., 1999). The term peak performance refers to any kind of superior performing experience in which behaviour is more creative, productive, efficient, or in some way better than normal behaviour (Privette & Landsman, 1983). There have been two main methods for exploring peak experiences. Most researchers have taken a phenomenological approach with participants providing free written or oral accounts of their experiences. To overcome the wholly qualitative nature of this method, researchers have begun to administer self-report questionnaires alongside the free, autobiographical accounts. The questionnaires contain Likert Scales and so this method gathers both quantitative and qualitative data. In the area of music performance, researchers have collected qualitative accounts of musician's peak performance experience. One participant, a saxophonist described a peak experience of music performance:

> All of a sudden nothing seemed to matter except the music.... The things I practiced seemed to just come out. I never thought about which fingering I would use or when I would breathe. It just came out naturally. All I thought about was expressing myself in the way that I thought the piece should sound. I never noticed there was an audience after the first eight bars of music. Not until I was finished did I even realize there was someone listening. Even now I don't remember their applause but only my feeling of satisfaction in playing the piece the way I actually felt it should be played. (Privette, 1983, pp. 195–196)

Privette (1983) identified two factors exclusive to peak performance experiences: a clear focus on self, object, and relationship, and intense involvement in the activity. Crucially, the activity that elicits the peak performance experience should hold an intrinsic value for that individual.

1.3 FLOW THEORY

Similar to the optimal experience phenomena of peak (or joyous) experience, and peak performance is a third concept: "flow" (Csikszentmihalyi, 1975). Just like peak experience and peak performance, flow is an optimal experience encountered during an activity. Csikszentmihalyi sought to understand the roots of human happiness. He began by conducting a series of research interviews with creative experts from different fields to try to understand what motivated them to spend their lives doing things which did not lead to fame or fortune. Flow Theory originated in these experts' accounts of how it felt to do what they were doing. The common factor across the accounts was experiences that were intrinsically rewarding (Csikszentmihalyi, 2002). From analysing many of these accounts, Csikszentmihalyi was able to develop and refine the concept of flow. Flow is a state that occurs when people are so absorbed by an activity that nothing else seems to matter. People will be motivated to do that activity, even at great cost, purely because it is so enjoyable. Flow has been described as an automatic, effortless, highly focussed state of consciousness (Csikszentmihalyi, 2002). The experience of flow can be identical regardless of the activity that produces it.

Based on the findings of interviews on individual flow experiences across many

different fields, Csikszentmihalyi has identified nine elements present in most experiences of flow (cited in Martin & Jackson, 2008, p. 146):

1. Challenge-skill balance (feeling competent enough to meet the high demands of the situation)
2. Action-awareness merging (doing things spontaneously and automatically without having to think)
3. Clear goals (having a strong sense of what one wants to do)
4. Unambiguous feedback (knowing how well one is doing during the performance itself)
5. Concentration on the task at hand (being completely focused on the task at hand)
6. Sense of control (having a feeling of total control over what one is doing)
7. Loss of self-consciousness (not worrying what others think of oneself)
8. Transformation of time (having the sense that time passes in a way that is different from normal)
9. Autotelic experience (feeling the experience to be extremely rewarding)

Research in flow is important to our understanding of optimal experiences and of happiness. Research has suggested that after a flow state a person experiences happiness (Csikszentmihalyi, 1990). It is not experienced during flow because it would be a distraction from the flow experience. Csikszentmihalyi has concluded, therefore, that the more flow we experience, the happier we are likely to be (Csikszentmihalyi, 1997). Csikszentmihalyi argues that optimal experience is something that can be controlled by each individual and that those who learn to control "inner experience" will be able to determine the quality of their lives, which is as close as anyone can come to being happy (Csikszentmihalyi, 2002). Just like peak experiences, flow experiences are always positive, not negative.

There are different degrees of flow. Micro flow tends to be associated with low-level flow experienced during simple daily activities. Macro flow describes high-level flow experiences usually associated with more challenging or important activities. Peak experience and peak performance, therefore, are both examples of high-level flow experience.

1.3.1 Methods for Measuring Flow Experiences

Researchers have developed different methods for measuring flow. The most common method is the self-report questionnaire. There are three main questionnaires: the Flow State Scale 2 (FSS-2; Jackson & Eklund, 2002), the Dispositional Flow Scale 2 (DFS-2; Jackson & Eklund, 2002), and the Flow Questionnaire (Csikszentmihalyi, 1975; Csikszentmihalyi & Schneider, 2000). Another self-report method which has been used to investigate flow experiences is the Experience Sampling Method (ESM; Csikszentmihalyi, Larson, & Prescott, 1977). Participants are given a pager which beeps every 2-hour period during a day at which point participants write down what they are doing, where they are, who they are with, and so on. This provides researchers with a sort of virtual film-strip of a participant's life. The ESM allows researchers to collect data about people's thoughts, feelings, and experiences in real-life situations and to obtain instantaneous descriptions of the quality of these experiences. This reduces the retrospective element of the self-report questionnaires, although it still relies on participants' self-reporting. There have been some limitations for the ESM. In some studies, participants failed to complete the forms when they were out of range of the signal, when they were engaged in a sports activity, when it was impractical, when they were sleeping, when they did not feel like it, or when they forgot to take the pager and forms with them (Csikszentmihalyi, Larson, & Prescott, 1977). This has resulted in missing or incomplete sets of data.

An alternative qualitative method of researching peoples' experiences of flow is through interviews. This allows the researchers to gain more in-depth insights into an individual's experience of flow. This has been particularly useful in exploring the flow experiences of elite athletes (Jackson, 1992), creative people (Csikszentmihalyi, 1988), and professional dancers (Hefferon & Ollis, 2006). The reliance on self-report methods for the measurement of flow experiences has been a concern for some researchers. One more objective method of measuring flow is through physiological responses in combination with self-report measures (e.g. de Manzano et al., 2010). However, flow studies incorporating physiological measures have been a relatively recent development and much work remains to be undertaken in this area.

1.3.2 Flow in Everyday Life

Flow theory is an important development in optimal experience research and the theory

seems to have been applied more widely than other optimal experience frameworks. This could be because flow theory can describe different levels of optimal experience, enabling a broader appeal and applicability across different contexts. Examples of research into peoples' experiences of flow in everyday life, sport, and dance will be outlined briefly here. Numerous studies have examined people's experiences of flow in everyday life using the ESM. Studies have investigated adolescents' activities and motivations (Csikszentmihalyi, Larson, & Prescott, 1977; Csikszentmihalyi & Kubey, 1981), finding that adolescents were more likely to experience flow in activities they were actively engaged in, rather than passive activities such as watching television. Other ESM studies have found that workers are more likely to experience flow in work than in leisure time (Csikszentmihalyi & Lefevre, 1989), and have examined flow in relation to optimal experience, similar to Maslow's peak experience (Clarke & Haworth, 1994). For the latter study, ESM was combined with a questionnaire, assessing general health, affect, life satisfaction, and self-esteem. The participants who experienced the flow were identified from the questionnaire as having better long-term psychological well-being. These participants may be examples of individuals with autotelic personalities.

These findings are in line with those of Csikszentmihalyi (1988). Although the findings of this study were unclear in terms of flow as an optimal experience, it did show that those participants who did experience flow felt immediate enjoyment and had greater long-term psychological well-being than other participants. ESM research has also shown that almost any activity can produce flow, so Csikszentmihalyi has been able to conclude that it is possible that quality of life can be improved by making sure that flow experiences occur in everyday life. For performing musicians, the implication of such a conclusion is that the experience of flow states during performance and rehearsal or practice sessions may be beneficial for long-term psychological well-being and may result in feelings of immediate enjoyment and happiness. It seems that performing musicians' experiences of flow may be positive, important, and desirable.

Self-report measures have also been used in studies of flow in everyday life. Researchers have examined the relationship between flow and well-being for Japanese college students (Asakawa, 2004), using the Flow Questionnaire (Csikszentmihalyi, 1975) and Roseberg's Self-Esteem Scale (1965). Results showed that those who experienced flow more often in their daily lives were more likely to exhibit higher self-esteem and lower anxiety, and use active rather than passive coping strategies compared

to their peers who experienced less flow. Those who experienced more flow also tended to report active commitments to college life, career prospects and daily activities in general. This study replicated previous findings on flow, such as positive associations of flow with self-esteem (Wells, 1988) and life satisfaction (Clarke & Haworth, 1994; Han, 1988; Peterson et al., 2005). Elsewhere, self-report instruments have also been used to investigate associations between flow proneness and the major dimensions of the standard five-factor model of personality (Ullen et al., 2012). It was found that flow proneness was related to the major 5 personality dimensions, but not to intelligence. There was a positive relation between conscientiousness and flow proneness. The researchers speculate that this could be because individuals who score highly for conscientiousness are more likely to spend time mastering higher levels of challenge. This finding could be particularly relevant for expert performing musicians, who spend much of their time mastering fine motor movements and complex musical material.

1.3.3 Flow in Sport and Dance

The flow experiences of athletes and dancers may be similar to those of performing musicians. All three types of participant are experts in a particular field of performance, dedicate a great deal of time to practice, and perform in front of audiences – often in high-pressure situations. In the area of sport, researchers have also used self-report measures to assess athletes' experiences of flow. Jackson, Thomas, Marsh, and Smethurst (2001) used self-report instruments to assess participants' sport self-concept (Elite Athlete Self-Description Questionnaire), psychological skills (Test of Performance Strategies) and flow experiences (Flow Questionnaire), and found that the positive perception of self as an athlete and positive psychological skills scores were associated with high flow scores.

In addition to self-report measures of flow, researchers have also used qualitative methods. Jackson (1992) conducted a qualitative investigation into the flow experiences of elite figure skaters in order to gain greater insight into the nature of flow in sport. Sixteen former US National Champion Figure Skaters were interviewed. They were asked to describe an optimal skating experience, and then questioned extensively about factors associated with achieving optimal, or flow states, during performance. Analysis of the skaters' accounts showed that factors perceived as most important for reaching a flow state included a positive mental attitude, positive pre-competitive and competitive

affect, maintaining appropriate focus, physical readiness, and, for some duo skaters, unity with partner. Those factors which were perceived to prevent or disrupt flow included physical problems/mistakes, an inability to maintain focus, a negative mental attitude, and lack of audience response. These elite athletes placed very high value on flow-like states, and their descriptions of their optimal skating experiences paralleled many of the characteristics of flow described by Csikszentmihalyi (1975, 1990).

In the related area of dance, Hefferson and Ollis (2006) have taken a phenomenological approach to exploring the flow experiences of nine professional dancers through in-depth semi-structured interviews. The aim of the study was to establish the existence and extent of the experience of flow in professional dancers, and also to determine and propose the environmental conditions that can enhance or inhibit flow. Semi-structured interviews were conducted with nine professional dancers. Transcripts were analysed individually using interpretative phenomenological analysis (IPA) and then compared to others in the study. The researchers found that three of Csikszentmihalyi's flow conditions were main themes common to almost all of the transcripts: enjoyment, challenge-skill balance, and autotelic experience. It was also found that there were several factors which the dancers felt influenced their experience of flow. These included confidence, connection to the music and choreography, relationships with other people involved in the production, familiarity with the environment on-stage, pre-performance routine, and costume and make-up. The semi-structured interviews allowed the researchers to collect valuable, rich, in-depth data from their expert participants. Research relating to flow experience in music and music performance will be reviewed later.

1.4 STRONG EXPERIENCES OF MUSIC

Music is an activity commonly understood to induce flow states, peak experiences, or peak performance experiences for performers. Interestingly, Maslow (1971) found that of all activities, the two most likely to be described by people as a peak experience were sex and music. Another framework for examining optimal experiences is the Strong Experiences of Music (SEM) descriptive system, which differs from those described above because it applies exclusively to musical encounters, and includes experiences that are negative as well as positive. The original SEM project was a large-scale Swedish research study, initiated by Gabrielsson in 1989. A smaller-scale SEM study

with UK university students has since largely supported the findings of the original study (Lamont, 2012).

The original SEM project's researchers decided not to use Maslow's peak experience terminology. Instead, they adopted a more general view and referred to the experiences simply as "strong experiences" of music. The aim of this large-scale study was to identify components of strong experiences of music, as well as causes and consequences. Almost 1000 participants were recruited nationwide through advertisements in the mass media. Participants were aged 13 to 90 years with an even distribution. Some participants provided more than one report. There were 1354 reports in total. The study included accounts by amateur musicians (over 56% of the sample), professional musicians (20% of the sample), and those who did not perform music (nearly 25%).

Participants were asked to describe their "strongest, most intense experience of music" as a free account. No examples of strong experiences were provided. Participants were asked to provide additional details of feelings experienced before and after, how often they had had similar experiences, and whether they had had these strong experiences in any situations other than music. 10% of the accounts were interviews, 90% were written reports. Around 522 participants also answered an additional questionnaire concerning reactions in strong experiences of music by rating experiences on a ten-point Likert-type scale.

Results showed that the genre of music pertaining to the strong experiences varied greatly, with older participants more likely to describe strong experiences of classical music, and younger participants more likely to describe pop/rock music. A content analysis of all reports was undertaken and the themes were sorted into a "Descriptive System," containing seven categories which delineated the different types of strong experiences (some overlap between categories was acknowledged due to the difficulty of categorising human subjective experiences accurately):

1. General Characteristics: described as a unique experience, or hard-to-describe, or that words are insufficient.
2. Physical reactions and behaviours: physiological reactions, actions, and quasi-physical reactions.
3. Perception: descriptions of auditory, tactile, visual, or synaesthetic perception. Also intensified or multi-modal perception and musical perception-cognition.

4. Cognition: A changed or special attitude. Feelings of expectancy, receptivity, absorption. Changed experience of situation, body-mind, time-space, part-whole. Loss of control. Changed or special relation to the music. Associations, memories, thoughts, imagery. Musical cognition-emotion.
5. Feelings/Emotion: intense or powerful feelings, positive feelings, negative feelings, different feelings, using music to affect one's mood.
6. Existential and Transcendental Aspects: religious experiences.
7. Personal and Social Aspects: New insights, possibilities, needs. Confirmation or self-actualisation. Sense of community. Communication.

The results of the study showed that 81% of the strong experiences of music were listening experiences. This is unusual considering the large proportion of performing musicians in the sample. Thus, only 19% of experiences related to performing or composing music. Strong experiences were perceived as being rare experiences with participants estimating their occurrence once a year if at all.

1.5 OPTIMAL EXPERIENCES OF MUSIC

Drawing upon the frameworks described above, notably flow theory, optimal experience research in the domain of music has explored the experiences of professional and amateur musicians, music students, and children, in relation to the activities of composition, listening, and performing. Research on music performance is particularly important in the context of this thesis and studies have focussed on musicians in both solo and ensemble contexts.

1.5.1 Solo Performance

One of the first studies on musicians' experiences of flow states investigated the development of performance skills in adolescent musicians at a specialist music school and their relation to flow experiences by using the Experience Sampling Method (O'Neill, 1999). The researcher found a positive correlation between high achievement in music performance, as assessed by performance exam results, and the number of flow states reported. It seems possible from the results of this study that greater expertise in music performance may lead to more optimal experiences during practice and

performance activities. Further evidence in support of a relationship between levels of expertise in musicians and their proneness to flow states was found by Sinnamon, Moran, and O'Connell (2012). In their study, flow states were reported by 95% of the elite musicians, compared to 87% of the amateur musicians.

Research into performing musicians' experiences of flow has been regarded as problematic in terms of how flow is measured. Self-reporting methods have to be employed after flow experiences so reporting is retrospective and, just as in the areas of everyday life, sport, and dance, relies on participants providing accurate accounts. Observational methods have been used to study the flow experiences of children. Physiological measures have recently begun to be developed in order to provide more objective measures. Most recently, researchers have explored the psychophysiological underpinnings of flow states in pianists. Researchers have investigated solo pianists' experiences of flow during performance using a combination of self-report measures and physiological responses (de Manzano et al., 2010). It was found that flow is associated with decreased heart period, blood pressure and heart rate variability as well as with increased activity of the zygomaticus major muscle and respiratory depth. Other recent studies have also addressed the issue of how to assess flow experiences in musicians (Martin & Jackson, 2008; Sinnamon, Moran, & O'Connell, 2012; Wrigley & Emmerson, 2013), and have found that flow scales developed for fields other than music, such as the FSS-2 and the DFS-2, are reliable instruments applicable to the domain of music.

Adding to the evidence that experiences of flow are beneficial for musicians' long-term psychological well being and general mood, Fritz and Avsec (2007) found significant positive correlations between three of the flow components (challenge-skill, autotelic experience, and clear goals) and both life satisfaction and positive affect.

Furthermore, since flow is regarded as an emotional and intrinsically rewarding experience (Csikszentmihalyi, 1990), and music communicates emotions (Juslin & Sloboda, 2010), being able to deal with musical emotions may be a factor in achieving a flow state during music performance. Marin and Bhattacharya (2013) investigated emotional intelligence as a predictor of flow in solo piano performance students. They found that practice amount and trait emotional intelligence were both significant predictors of flow for the pianists. The short form of the Trait Emotional Intelligence Questionnaire (TEIQue-SF; Petrides & Furnham, 2006) was used to assess various dimensions of emotional intelligence, one of which was participants' abilities in

exercising empathy. Future work may investigate whether trait empathy may be a factor in achieving a flow state during performance.

1.5.2 Ensemble Performance

Outside the area of solo music performance, researchers have examined the performances of musicians in ensembles, alongside related studies on work groups. For example, Guzzo and Shea (1992) and West and Anderson (1996) have highlighted the importance of individual knowledge and skills, team composition, objectives and support systems, and the interactions among group members in influencing a group's performance. In the area of music ensemble playing, much research has been dedicated to investigating ensemble musicians' social and musical interaction in order to understand more fully how ensembles perform together at a high level (e.g. Davidson & Good, 2002; King, 2004; Murnighan & Conlon, 1991; Seddon, 2005). Given the large number of studies that have explored various aspects of ensemble playing in recent years, surprisingly little research has specifically examined musicians' optimal experiences of ensemble performance. The few studies which have fully or partially addressed optimal experiences of ensemble playing will be reviewed here and the differences between solo and ensemble optimal experiences of performance will be considered.

In their investigation of flow in relation to well-being and affect, Fritz and Avsec (2007) found that most accounts of flow experiences during music performance given by participants were related to playing in an orchestra or singing in a choir, rather than solo performance. The researchers speculate that this could be due to the shared responsibility for the performance. Another study has specifically examined musicians' peak performance experiences in orchestral playing (Marotto et al., 2007) using an ethnographic approach based on participant observation. As part of their conceptualisation of group peak performance, the researchers describe group members' achievement of heightened experience and shared values through a "shared consciousness." They also apply notions of collective mind and mindfulness (Weick & Roberts, 1993) to describe the interaction between members of the orchestra during performance. These notions of shared consciousness, collective mind, and mindfulness seem to be a key difference between solo and ensemble optimal experiences of performance.

The importance of the social and interactive nature of optimal experiences of ensemble as opposed to solo performance has also been emphasised in SEM research by both Gabrielsson (2001), and Lamont (2009). 29% of the accounts of professional musicians in Gabrielsson's study referred to performing experiences. Strong experiences of performing music included descriptions of being overwhelmed by expression, and "magic moments" when everything worked and the music seemed to play itself. The accounts included descriptions of understanding the music completely, the music becoming "self-evident," and, of particular note, were accompanied by intense feelings of interaction with other performers. In reporting the findings of her SEM study, Lamont also notes the emphasis placed on the social nature of the strong experiences of performance by many participants.

As part of his examination of the musical and social interaction in ensemble jazz improvisation, Berliner (1994) describes the way the musicians achieve a collective state of mind as "striking a groove together." Describing his optimal experiences of performing with others, bassist Chuck Israels explains: "if it's working, it brings you very close. It's a kind of emotional empathy that you develop very quickly. The relationship is very intimate" (Berliner, 1994, pp. 349–350. Melba Liston, the famous jazz trombonist, adds to this notion of the importance of the development of collective mind to optimal experiences of performance, saying: "everybody can feel what each other is thinking and everything. You breathe together, you swell together, you just do everything together, and a different aura comes over the room" (Berliner, 1994, p. 392). In jazz and improvised music as opposed to classical music, this collective state of mind is perhaps more immediately apparent to an observer, since the musicians are creating new material all the time, responding to what a co-performer has just played. Nevertheless, similar processes of interaction can be found in classical ensembles as co-performers seek to produce unified, expressively cohesive performances.

Further emphasis on the importance of the collective social experience of an ensemble to achieving an optimal experience can be found in Sawyer's work on "group flow." As part of his research into creativity, Sawyer (2006) introduces the concept of group flow to describe a musical ensemble performing at its peak. The concept of group flow is related to flow theory. Sawyer (2008) identified four components of flow that were essential for group flow: clear goals, complete focus on the activity, a balance between challenge and skill, and feedback. Rather than being a psychological state like flow, Sawyer describes group flow as being an emergent property of a group. It involves

the collective social experience of the whole ensemble and occurs when interactional synchrony is at its peak.

In reviewing the existing literature on optimal experiences of ensemble performance, it seems likely that the key difference between solo and ensemble optimal experiences of performance is the social aspect of ensemble performance. Specifically, researchers have described an ensembles' achievement of a collective state of mind as an important element of optimal experiences of ensemble performance. This collective state of mind has been described variously as "striking a groove" (Berliner, 1994), "shared consciousness" (Marotto et al., 2007), and "group flow" (Sawyer, 2006). Despite acknowledging this collective state of mind as a central feature of ensemble musicians' optimal experiences of performance, no study has yet examined directly how this state might be achieved. One musician described this collective state of mind anecdotally as coming about through a kind of "emotional empathy" (Berliner, 1994). It seems possible from this examination of the existing literature that co-performer empathy may facilitate social and musical interaction in ensemble playing, and may be key to establishing this collective mind in an ensemble.

1.6 CONCLUSION

Peak performance, flow, and strong experiences of music are all similar concepts grounded in Maslow's notion of peak experience. There are many points of overlap between these concepts. For example, Maslow's conditions for peak experience include time distortion, loss of fear, and a sensation of effortlessness which have also been identified as conditions for Csikszentmihalyi's flow theory. Panzarella's dimensions of joyous experiences include a physiological response also identified in Gabrielsson's strong experiences of music scheme. However, although the concepts are similar they are not identical. For instance, peak experiences are universally positive, whereas strong experiences of music can be negative as well as positive. There may also be different levels of peak experience. True peak experiences are extremely rare. Lesser peak experiences might more accurately be referred to as "exceptional experiences" (Whaley, Sloboda, & Gabrielsson, 2008). Whilst the term peak experience may be used to describe any of the concepts outlined above, it is important to acknowledge the subtle differences and the many overlaps between the concepts.

For performing musicians, optimal experiences are desirable, since they have

been found to be important for well-being, mood, and motivation. Optimal experiences of ensemble performance have been reported in several studies using various optimal experience frameworks, and seem to be related in some way to co-performer interaction – the difference between solo and ensemble optimal experiences of performance. Performers have described a central feature of optimal experiences of ensemble performance as a collective state of mind. It is possible that empathy may facilitate co-performer interactions and the establishment of this collective state of mind. Empathy may, therefore, be an important factor in the achievement of optimal experiences during ensemble playing.

CHAPTER 2. THE PROBLEM OF EMPATHY

Despite its apparent etymological roots in Ancient Greek, empathy is a relatively recent intellectual concept. In the post-war years, empathy has received considerable research attention, mainly due to its being viewed as a means of understanding a range of different psychological and mental phenomena, including communication, social interaction, consciousness, and emotion. The history of empathy research is both varied and colourful, and this is reflected in the existence of a number of conflicting definitions and conceptualisations of the term across both scientific and non-scientific fields. The genesis of the term "empathy" is inextricably linked to the earlier concept of "sympathy." Even today, much confusion surrounds both terms and their two definitions are conceptually intertwined. However the early history of the two concepts offers a little more clarity. This chapter will review the history of empathy research, beginning before its conceptualisation with a brief examination of the related concept of sympathy, and then exploring the development of empathy research through the lens of various disciplines. Finally, research relating to music and empathy will be considered.

2.1 THE BEGINNINGS OF EMPATHY

2.1.1 Sympathy

The first recorded account of sympathy is found in influential philosopher of science David Hume's (1739) publication, *A Treatise of Human Nature.* The word sympathy has its roots in Ancient Greek (*sym* + *pathos*), translating literally as "feeling with." Hume coined the term to describe a spread of emotion from one person to another. His conceptualisation suggests a passive process in which one person receives the feelings of another through communication. Two decades later Hume's sympathy was also redefined and extended by the economist and philosopher Adam Smith (1759/1976), in his *The Theory of Moral Sentiments.* In a way, Smith simply extended Hume's work on sympathy. Smith believed that humans have a natural, almost overwhelming, tendency to experience "fellow-feeling," a matching of affective state, when we witness someone experiencing a powerful emotion. Smith held that the fellow-feeling could be any one of the full range of emotions, depending on the affective state of the person observed. We

might share joy with a successful athlete, for example, or fear with a frightened person.

Smith's conception of fellow-feeling extended to include another kind of fellow-feeling distinct from sharing an individual's affective state, which he described as an emotional reaction to another person. Feeling pity for a beggar, for example, is not exactly the same process as sharing an affective state which more or less matches the state of the object. Both the matching of affective state with another person and the emotional reaction to another person were placed under the same heading of sympathy. Smith argued that in both cases imagination was responsible for sympathy. He asserted that it is only through imagining oneself in another's situation that fellow-feeling can be experienced. Our senses alone cannot fully inform us of the physical or emotional experiences of another, we must imagine.

Herbert Spencer (1855) put forth another view of sympathy and its development in his *Principles of Psychology.* Spencer's theory was based on the underlying sociality among humans. He argued that there is a need for a high level of social contact between humans and that sympathy is a result of this repeated contact. He offered an example of sympathy as a means of collective communication driven by survival instinct. He suggested that an individual's fear in response to a predator, for example, produces a fear reaction in that individual. Other creatures present not only experience fear in response to the predator, but also associations between their own fear and the fear responses of others. As a result of evolution over the course of many years, the fear reactions of others cause fear in the individual even when there is no observed frightening stimulus. In this way, Spencer argued, sympathy has become a means of communication. This conceptualisation of sympathy retains Hume's and Smith's notion of a shared affective state to some degree, but lacks the active, cognitive component of imagining and responding to another's affective state implicit in Smith's fellow-feeling.

Of these early conceptualisations of sympathy Smith's fellow-feeling as an affective response to an observed other is closest to what we might understand as high-level empathy. It is an active, imaginative process, involving perspective-taking, and, therefore, has a strong cognitive component. An individual must imagine himself in another's position, or imagine being another. The sharing or matching of another's affective state, on the other hand, may be closer to conceptualisations of sympathy or emotional contagion.

2.1.2 Early Empathy Research

The earliest conceptualisations of sympathy had their roots in 18th-century philosophy. However, the word empathy did not appear until over a century later and, unlike the more philosophically rooted sympathy, empathy was initially applied to German aesthetics. *Einfühlung* literally translated as "feeling into" and it originally described the tendency of observers to project themselves into a physical object of beauty; how they experienced aesthetic objects (Vischer, 1873/1994). German philosopher Theodor Lipps employed the term in a more psychological context, applying it to the process by which we come to know others' mental states. Lipps first wrote of his concept of *Einfühlung* in *Leitfaden der Psychologie* (1903). Lipps' conception of empathy was that it was a process of inner imitation, based on a natural instinct, in which a person imitates the movements or expressions of an object or individual..

Einfühlung was not translated into our English word empathy until 1909 when Titchener published his *Lectures on The Elementary Psychology of Thought Processes.* He adapted the Greek word *empatheia*, and retained the literal meaning of *Einfühlung*: "feeling into." Titchener shared Lipps' conceptualisation of empathy as inner imitation. They held that in observing another's emotional state, the observer is prompted to covertly, internally imitate that other's emotional cues, by tensing muscles when observing an individual under stress, for example. As a result, the observer experiences a weaker version of the emotions experiences by the observed other. In this way the emotional state is shared.

At this point in their early history sympathy and empathy might be recognised as two distinct processes. Sympathy as conceptualised by the moral philosophers could perhaps be thought of, in general terms, as a more passive, affective process. The process by which an observer came to share an affective state or was moved by another's experience, whilst empathy as conceptualised by Lipps and Titchener was a more active, cognitive attempt by one individual to imitate the experience of another. However, even at this early stage of conceptual development, it is evident that there is some ambiguity as to their exact definitions and the precise distinction between them. The exception to the rough distinction drawn here is Smith's conceptualisation of sympathy as an imaginative process. Smith's sympathy in which one individual imagines and then responds to the affective state of another, is much closer to Lipps and Titchener's conceptualisation of empathy as an active process. It is an example of

empathy with a strong cognitive component.

The conceptualisation of empathy as a more active process than sympathy resulted in greater emphasis on a cognitive rather than an affective aspect. Kohler, Mead, and Piaget, who closely followed the work of Lipps and Titchener, each conceived of a cognitive empathy. Kohler (1929) suggested that empathy was an understanding of another's feelings, rather than a sharing of them. He emphasised the observation and interpretation of another individual's actions in order to understand, taking the focus away from the process of imitation of emotion. In his research on empathy, Mead (1934) also placed great emphasis on understanding others being the aim. He outlined a process of role-taking as a means of understanding another's perspective of the world. This was an important part of social development. It requires a person to imagine the perspective of another individual and to anticipate that individual's reaction to one's behaviour. In this way, a person can then adapt his behaviour depending on the social circumstances. Similarly, Piaget's (1932) work on "decentering," a cognitive skill acquired by children as they develop, focussed on a child's ability to distinguish between their own experiences and those of others. The awareness of and the ability to understand others' perspectives and experiences is another form of active cognitive empathy.

It is evident that even from the very beginning, the distinction between sympathy and empathy as two separate concepts is not exact. It is on this ambiguous inception that the research history of both concepts is based. Yet, this early definitional confusion has resulted in many disagreements and miscommunications between researchers and across disciplines.

2.1.3 Phenomenology

The phenomenologists Edmund Husserl and Edith Stein also published their own views on Lipps' *Einfühlung,* or empathy. They considered empathy in relation to the problem of intersubjectivity, that is, how can we know others' mental states, and both considered empathy as a solution to that problem. They viewed empathy as a unique kind of consciousness which allows us to experience others' thoughts, emotions, and experiences directly. Husserl had been one of Lipps' students; Stein was Husserl's student. Husserl had taken over Lipps' expression *Einfühlung*, to name the experience through which we are aware of the intentional acts of others. His uses of the word did

not always coincide with Lipps' usage. He had used the word in his book *Ideen* (1913/1962), but nowhere had he defined the concept. Stein proposed this question as her dissertation topic and this resulted in her thesis *Zum Problem Der Einfühlung* (1916/1989). Stein made a detailed study of Lipps' work on *Einfühlung* and was dismayed at the varied uses to which he put his concept of empathy. She was further dismayed by the discovery that whatever Lipps meant by *Einfühlung*, was something very different to Husserl. In his work, Husserl had treated *Einfühlung* as a piece of unfinished philosophical business. A set of philosophical questions he had not yet addressed in sufficient detail. For instance, what is it that enables us to recognise the body of another as a living body, a body with its own sensations, and through that recognition as the body of another with whom I can communicate? He had not yet attempted to answer these questions, but evidently he hoped that Stein would expand on and explain his ideas in her thesis.

The declared aim of Stein's research was to identify the essential characteristics of empathetic awareness – the awareness of the thoughts and feelings of others. Stein argued that empathy allows us to understand others, and to understand ourselves as others experience us. Unlike Lipps' interpretation of empathy, where a fusion between observer and object was implied, Husserl and Stein both argued that there is no loss of self during empathy. Empathy, according to Stein, is a process involving an initial cognitive act of intellectual understanding of another's feeling and inner state, followed by reflection, leading to one's own feeling in response to the other's experienced feeling. Whilst we can understand others' experiences they do not become our own, but evoke a parallel and related feeling which is our own. Empathy is a process taking place over a period of time, rather than being a discrete event. Sympathy and contagion, Stein argued, are related but distinct concepts. Sympathy is an element of the empathic process and can be described as "fellow feeling." Contagion involves a non-cognitive transference of feeling. In contagion, our attention is on our own emotional state and response rather than those of the other. It results in a feeling of "oneness" in which sense of individual self, one of Stein's conditions for empathy, vanishes.

Around the same time, this phenomenological view of empathy as a means of understanding the content of another's mind became closely associated with the hermeneutical concept of *Verstehen* (understanding) through the work of Wilhelm Dilthey (1883). *Verstehen* typically described the means by which one understands texts, events, and works of art. Empathy was used here to distinguish between the

natural and humanistic sciences. The natural sciences involve physical events and scientific explanation and so researchers must adopt an objective, external approach. In contrast, the human sciences involve human actions and social phenomena and *Verstehen,* rather than scientific explanation. Empathy became a kind of epistemological tool for the human sciences.

From this point on, research on empathy was undertaken by many different researchers working in a wide variety of disciplines. This review will outline the history and development of empathy research across various disciplines as it pertains to our understanding of the concept and its usage in contemporary musicological research.

2.2 CLINICAL PSYCHOLOGY AND PSCYHOANALYSIS, C. 1920–1970

Following this initial excitement over empathy as a tool for understanding the human sciences, as well as a solution for the problem of intersubjectivity, empathy was rather neglected by philosophers until much later in the twentieth century. It was not until the 1970s that philosophy's interest in empathy began to be revived. During the intervening period, clinical psychology and psychoanalysis came to the forefront of empathy research. Clinical psychology's interest in empathy had begun with Freud, who argued that empathy was responsible for our understanding of "what is inherently foreign to our ego in other people" (Freud, 1921/1959, p. 66). Despite Freud's admiration for Lipps and this brief mention of empathy, empathy did not play a starring role in his model of the therapeutic relationship. It was the humanistic psychologist Rogers (1969) who recognised empathy as central to a good client-therapist relationship. His model of client-centred therapy was influential in the practice of clinical psychology. According to Rogers empathy in client-centred therapy relies on the therapist de-centring, that is laying aside one's own views and values, in order to share the perspective of one's client without prejudice. In order to successfully empathise with a client, the therapist must also communicate with the client to check that his or her empathic understanding is accurate. Rogers held that empathy is vital in order for therapy to be successful, although he recognised that empathy is difficult to achieve. He also highlighted the importance of reinforcing client-therapist boundaries to avoid the problem of over-identification, which he believed resulted in a distorted empathic understanding and ultimately a failure of therapeutic process.

Another of Rogers' peers, Kohut, came to agree with Rogers that empathy is of

paramount importance to the client-therapist relationship. From this insight he was able to create "self-psychology" in the 1960s, a form of therapy which remains popular today. Self psychology evolved out of psychoanalysis, but it places great importance on empathy as the most important feature of a therapist-client relationship. Self psychology argues that empathy in early childhood is responsible for healthy development. It relates the development of psychopathologies and self-esteem issues to disrupted or inadequate experiences of empathic mirroring from one's parents in early development. Early experiences of empathic mirroring lead to positive self-object experiences. This idea of early emotional attachment between child and mother being important for the development of healthy empathy was another Freudian idea (1930/1961). Kohut (1968) concluded that empathy was important for the therapist to gain insight into the client's experience, as well as making the client more receptive to their therapist's interpretations and showing them how to relate to themselves.

2.3 THEORY OF MIND, C. 1970 ONWARDS

Rogers and Kohut were responsible for attracting more attention to empathy in the latter half of the twentieth century. The interest extended from clinical psychology to experimental and social psychology as well as to philosophy once again. Philosophy's empathy research revival began with a renewed interest in consciousness. In his famous article "What is it like to be a bat?," Nagel (1974) argued that conscious experience occurs at many levels of animal life. No matter how the form may vary, this means that there is something it is like to be that organism. Fundamentally, an organism has conscious mental states if, and only if, there is something that it is like to be that organism. Something it is like for that organism. Nagel emphasised the importance of similarity for empathy. We might be able to imagine what it would be like to behave like a bat, but we cannot know what it is like to be a bat. Our experience is not similar enough. In the same way, one person cannot fully know what the quality of another's experience is. It is possible only for someone sufficiently similar to the other person to be able to adopt his point of view. The more different from oneself the other experiencer is, the less success one can expect.

With the revival of interest in empathy research, certain differing theories of empathy came to be defined. For philosophy and psychology the cognitive nature of empathy research led to the development of theories concerned with how we understand

the mental states of others. Mental state attribution is variously referred to as "folk psychology," "mentalising," "mind-reading," and "theory of mind." Theory of mind refers to the ability of an individual to attribute mental states to oneself and others, to understand that others' mental states and intentions may differ from one's own, and to be able to use the information to predict the actions of others. Theory of mind research originated in Premack and Woodruff's (1978) study of chimpanzees where the researchers found evidence that chimpanzees were able to recognise and respond correctly to the perceived needs of a human. From that point, there have been three main approaches to theory of mind: "theory-theory," "simulation theory," and "rationality theory."

2.3.1 Theory of Mind: Three Approaches

2.3.1.1 Theory-Theory

Theory-theory argues that if an individual is given information about another person's observed behaviour, he or she can then make theoretical inferences or predictions about the observed person's mental states. It describes a theoretical stance towards other people. Theory-theorists disagree as to whether reasoning about others' mental states is a result of social interaction and theory testing developed during children's early years, or whether it is an innate ability. Certain developmental psychologists have championed theory-theory, applying it to young children who are viewed as little scientists since they form and revise their thinking on various subjects in a similar manner to scientists (Gopnik & Wellman, 1992; Gopnik & Meltzoff, 1997). Children collect evidence, make observations, and then change their theories based on this information in process mimicking science. They generate theories about mental states, like belief and desire, as well as physical phenomena, and, over time, children move from simple theories to more complex ones.

2.3.1.2 Rationality Theory

Rationality theory argues that people use principles of rationality to attribute mental states to others. According to rationality theory, individuals make the assumption that others are rational in decision-making, and then base predictions for behaviour or mental states on this assumption. Rationality theory has been championed by several philosophers, among them Daniel Dennett (1987). Dennett suggests that in trying to

attribute mental states to others, an individual takes an intentional stance. The default assumption that must be accepted for taking this stance is that the observed other's behaviour must be rational, given her environment and her other beliefs and desires. Goldman (2012) criticises Dennett's conceptualisation of rationality theory on the grounds that it does not extend beyond the mind-reading of propositional attitudes and does not appear to cover other types of mental state such as thirst or pain, or emotions such as anger or happiness. He concludes that there must be more to mindreading than imputed rationality.

2.3.1.3 Simulation Theory

Simulation theory argues that people use imagination, mental pretence, and perspective-taking to determine others' mental states. In order to understand or predict the mental state of a target, an observer will first create pretend desires or beliefs that correspond with those of the target. These pretend states are used to produce an outcome which can then be attributed to the target in order to predict or anticipate the target's mental state or action.

Dennett has criticised simulation theory on the grounds that it may be simply driven by theory-theory:

> How can [simulation theory] work without being a kind of theorizing in the end? For the state I put myself in is not belief but make-believe belief. If I make believe I am a suspension bridge and wonder what I will do when the wind blows, what "comes to me" in my make-believe state depends on how sophisticated my knowledge is of the physics and engineering of suspension bridges. Why should my making believe I have your beliefs be any different? In both cases, knowledge of the imitated object is needed to drive the make-believe "simulation," and the knowledge must be organized into something rather like a theory. (Dennett, 1987, pp. 100–101)

However, Goldman (1989) has argued for a distinction to be made between theory-driven simulation, where the systems are different from the observer, and process-driven simulation, where the systems are similar to the observer. If there are enough similarities, then theorising is not necessary. Goldman (1992) champions simulation

theory and posits the existence of some kind of "mixed theory," incorporating elements of theory-theory and simulation theory. He narrowly defines empathy as a mimicking of one person's affective state by that of another, not unlike the moral philosophers' conceptualisations of sympathy, and suggests that this happens through simulation theory. Crucially, Gallese and Goldman (1998) posited a link between simulation theory-driven mind-reading, and the mirror neuron system (Rizzolati et al., 1996), providing a neuroscientific basis for the theory. Mirror neuron research and its relationship to empathy will be considered in detail later.

2.3.2 Theory of Mind: Development and Impairment

Theory of mind appears to be an innate ability, but requires social and other experience over many years to develop fully. Different people may develop more or less effective theories of mind. Baron-Cohen (1991) has identified a critical precursor to the development of theory of mind in babies aged 7-9 months: an understanding of attention in others. Baron-Cohen suggests that the ability to direct one's attention to an object of interest, and to appreciate the directed attention and interests of others may be the underlying motive behind all human communication. For older children, one of the important theory of mind developmental milestones is the ability to attribute false beliefs. False belief tests have been developed (e.g. Baron-Cohen, Leslie, & Frith, 1985), and results have shown that most neuro-typical children are able to pass the tests around the age of four.

Theory of mind impairment describes an individual's difficulty or inability to perspective-take, and has been referred to as "mind-blindness" (Baron-Cohen, 1995; Frith, 2001). Individuals with mind-blindness have difficulty in determining the intentions of others, in understanding how their behaviour may affect others, and in social interaction. Mind-blindness has been observed in individuals with Autism Spectrum Conditions, personality disorders, schizophrenia and ADHD (Baron-Cohen, 2011; Korkmaz, 2011). Baron-Cohen (2011) has argued that individuals such as these may experience what he terms "zero degrees of empathy" as a result of this mind-blindness. Baron-Cohen suggests that zero degrees of empathy can be categorised as Zero-Negative (as in the case of psychopaths, narcissists, and individuals with borderline personality disorder) or Zero-Positive (for example, individuals with Autism Spectrum Conditions). In the case of Zero-Negative individuals there are different

degrees of extremity. For example, individuals may commit acts of cruelty, be insensitive to others, or simply be socially isolated. Baron-Cohen asserts that there are at least three distinct routes to developing zero degrees of empathy: early developmental trauma (through parental rejection or abuse), early experience of stress, and excessive admiration or praise (in the case of narcissists). He demonstrates that individuals with these personality disorders show underlying abnormalities in the empathy circuitry in their brains.

Zero degrees can be considered positive in the case of individuals with ASCs, argues Baron-Cohen, since the way their brains process information leads them not to be immoral, as in the case of Zero-Negative individuals, but to be super-moral. In addition, their empathy difficulties may be associated with having a brain that processes information in ways that can lead to talent, through strong systemizing. Systemizing is a process of pattern recognition that enables us to figure out how things work, and to predict future events. Like empathy, the systemizing mechanism varies in the general population. Individuals with ASCs tend to display the highest level of systemizing: level 6. Baron-Cohen explains that, whilst people whose systemizing level is lower can cope with some imprecision, at level 6 precision defines a system. This, Baron-Cohen argues, leads to zero degrees of empathy. How another person is feeling is not something that can be determined with precision. Emotions and behaviour are unpredictable and imprecise. If an individual's systemizing mechanism is highly tuned, their empathy mechanism will not be, since this does not permit imprecision or "unlawful" phenomena such as emotions. The behaviour of others is beyond comprehension, unlawful phenomena such as emotions are not of interest, and so empathy is impossible.

2.4 EMPATHY IN PSYCHOLOGY, C. 1960 ONWARDS

From the 1960s, psychology research has tended to focus on five aspects of empathy:

1. The measurement of empathy
2. The development of empathy
3. The role of empathy in altruism
4. Empathic accuracy
5. Gender differences in empathic responding

Unfortunately psychologists have not reached a general consensus concerning the definition of empathy. Research has focussed on both cognitive and affective aspects, and in more recent years some researchers have recognised that empathy includes both aspects. Similarly, there has been no consensus on the distinction between sympathy and empathy with some similar phenomena being labelled as "empathic" in some papers, and "sympathetic" in others. Aside from a general agreement that the core element of empathy involves the connection of one consciousness to another, there are a multitude of different definitions, and little uniformity in the use of key concepts. The five aspects of empathy outlined above will now be explored.

2.4.1 The Measurement of Empathy

2.4.1.1 The Construction of Empathy Scales

From the 1940s onwards, many measures of empathy were developed and most of these measures took the form of self-report questionnaires. Many of the early instruments that claimed to measure empathy did not, and so more scales were developed. The earliest measure for empathy had been constructed in the 1940s, the "Chapin Social Insight Test" (Chapin, 1942). Participants were presented with hypothetical scenarios and then asked to choose the most effective course of action from four options. This was described to be a measure of empathy despite it measuring much more than just empathy. In order to select one of the options a participant would have to use his or her understanding of social rules, cultural conventions, and other kinds of information. Another early empathy measure employed a rating scale and involved a group of participants. The group were left to interact with each other and then each participant was asked to estimate how each of the other members of the group rated them. The idea was that this rating test would determine how accurately one could predict another's view of oneself. However, it seems possible to achieve high levels of accuracy on this test without the accuracy being a result of empathy (Davis, 1994).

A more widely used test was the Empathy Scale (EM; Hogan, 1969). The EM as 64 items and has been found to have four factors: social self-confidence, even-temperedness, sensitivity, and nonconformity (Johnson, Cheek, & Smither, 1983). From examining these factors it is evident that the EM does more than just measure empathy. Another measure of empathy was the Questionnaire Measure of Emotional Empathy (QMEE) which was designed to assess an individual's tendency to respond strongly to

another's experience (Mehrabian & Epstein, 1972). An examination of the QMEE revealed that it may be a better measure of emotional arousability to the environment in general, rather than to the emotions of others (Mehrabian, Young, & Sato, 1988). The QMEE is also not a pure measure of empathy.

A later questionnaire, the Interpersonal Reactivity Index (IRI) was also developed to measure empathy (Davis, 1980). Until recently the IRI was considered to be the most accurate measure of empathy. It has four seven-item subscales examining perspective-taking, empathic concern, personal distress, and fantasy. Three out of four of these factors seem to be relevant to measuring empathy (Baren-Cohen & Wheelwright, 2004). However, the fourth, fantasy, does not seem directly relevant to the measurement of empathy. The inclusion of the fantasy subscale suggests that the IRI may measure processes broader than empathy. It is hard to see how items such as: "I daydream and fantasize, with some regularity, about things that might happen to me" might be relevant to the measurement of empathy. Although some of these items may be correlated with empathy, they themselves do not measure empathy directly.

In order to address some of the inadequacies of these previous measures of empathy, Baren-Cohen and Wheelwright (2004) developed the Empathy Quotient (EQ). The EQ consists of 40 statements. Participants are asked to indicate the degree to which they agree or disagree with each statement. There are four options to choose in response: "strongly agree," "slightly agree," "slightly disagree," and "strongly disagree." The EQ was designed so that not all of the statements are relevant to the measurement of empathy, in order to improve the validity of this self-report measure. The EQ is a validated measure of empathy (Allison et al., 2011) and has been tested in many different places and with both clinical and general populations. Other self-report measures of empathy have also been developed and validated, including The Questionnaire of Cognitive and Affective Empathy (QCAE; Reniers et al., 2011), and the Basic Empathy Scale (BES; Jolliffe & Farrington, 2006).

The scales outlined above all measure trait empathy. Baron-Cohen and his colleagues (Baron-Cohen et al., 1997; Baron-Cohen et al., 2001) have also developed a self-report test called "Reading the Mind in the Eyes" which assesses empathic accuracy. Participants are shown photos showing only the eye region, and are asked to choose one emotion word out of four that best describes what the person in the photo is thinking or feeling. Ickes, Bissonnette, Garcia, and Stinson (1990) developed a test of empathic accuracy involving watching a video of two people interacting. The

participant has to infer what one of the people is thinking or feeling at certain points during the video. Participants' answers are then compared to the thoughts and feelings reported by the person in the video at the same points.

2.4.1.2 Physiological Measurement of Empathy

Self-report measures can have low reliability (Chlopin, McCain, Carbonell, & Hagan, 1988), and low validity for measuring empathy (Eisenberg & Lennon, 1983; Levenson & Ruef, 1992). They are limited by human perception errors, and affected by social desirability (Duan & Hill, 1996). An example of social desirability affecting self-reported empathy is given in a study in which delinquent participants reported higher empathy (cognitive concern) than non-delinquent control participants (Kämpfe et al., 2009). This difference was partially accounted for by the higher social desirability in the delinquent participants. Using an indirect measure, it was found that empathy was, in fact, higher in the non-delinquent participants than in the delinquent participants. The findings of this study underline the importance of exercising caution when relying solely upon self-report measures of empathy (Neumann & Westbury, 2011). Physiological approaches to measuring empathy have sought to understand the behaviours and experiences associated with empathy.

Facial Electromyographic Activity (EMG) i**s t**he measurement of the electrical potentials that occur when muscle fibres contract and can be recorded through electrodes placed on the skin over the site of the muscle of interest. On the facial muscles associated with the expression of emotions are: the corrugator supercilli, zygomaticus major, lateral frontalis, medial frontalis, levator labii superioris, orbicularis oculis, and masseter (Dinsburg, 1990). The magnitude of the EMG signal increases when the muscle fibre units contract. The EMG is able to detect facial muscle activity below the visual threshold, thus making it a more sensitive measure than observer ratings of facial expression used in some research. Facial EMG has been shown to be correlated with self-reported empathy when viewing images of humans and non-humans (Westbury & Neumann, 2008). Facial EMG recorded whilst viewing images of happy and angry facial expressions has also been shown to be related to trait empathy as measured by the QMEE (Sonnby-Borgström, 2002; Sonnby-Borgström, Jönsson, & Svensson, 2003). The researchers found that the relationship may be influenced by stimulus exposure time. Dimberg, Andreasson, and Thunberg (2011) also found that people with higher trait empathy scores displayed greater empathic accuracy

accompanied by stronger EMG responses, when viewing images of happy and angry faces.

Electrodermal activity measures are sensitive to changes in the electrical activity of the skin (Andreassi, 2007). The most common measure is skin conductance, which measures the change in skin conductivity to an externally applied current. The conductivity will change according to the activity of the eccrine sweat glands in the skin. For this reason, skin conductance is typically measured where these sweat glands are most concentrated (e.g. palms, finger tips). The eccrine sweat glands are under the control of the sympathetic nervous system which means that skin conductance responses give an indication of activation related to non-specific visceral affective arousal. Skin conductance can be a non-specific response measure because it is sensitive to a wide range of psychological states. For this reason it is best used in combination with other physiological measures. One study using only skin conductance as an indicator of empathy compared participants' affective responses to receiving pain themselves to viewing another individual receiving the same pain (Hein, Lamm, Brodbeck, & Singer, 2011). Participants could then choose to spare the other person pain by choosing to receive it themselves instead. The results showed that skin conductance was a good predictor of the outcome of this choice. The closer in magnitude that the skin conductance responses were for their own pain and the observed pain of another, the more likely the participant was to choose to endure the pain themselves later.

Cardiovascular activity is sensitive to both affective and attentional states. This suggests it could be sensitive to various aspects of empathy response. It can be measured by ECG or by using transducers. So far, it has been relatively underutilised in empathy research, but there have been two studies of significance, employing heart rate as a physiological measure for empathy. Krebs (1975) examined skin conductance, heart rate and blood pulse volume in participants observing a target play a game of roulette. Participants were split into two groups. The first group were told that the target would win money or experience pain according to wins and losses in the game. The second group were told that the target was merely completing a cognitive task. The first group of participants showed larger physiological reactions than the second group of participants. In addition, the physiological responses were greater in participants who believed they were similar to the target. The researcher concluded that participants empathised with the target when he experienced pleasure or pain. It was found that heart

rate deceleration was associated with participants' experience of empathy.

In a later study, Levenson and Ruef (1992) measured participants' heart rate, skin conductance level, general somatic activity and pulse, to examine accuracy of empathic response. Participants viewed a video of interactions between two spouses and continuously rated the perceived affect of a designated spouse. Affect ratings and physiological data had previously been collected from the spouses in the video. How closely the observer's physiological responses and affect ratings mirrored the target spouse's were investigated as a measurement of empathic response. In terms of heart rate response, participants who were best able to rate the positive affects experienced by another individual displayed lower cardiovascular arousal. The results of the analysis also revealed that accurate rating by an observer of a target individual's negative emotions was associated with a state of shared physiology in which observer and target evidenced similar patterns of autonomic response over time.

Finally, neuroimaging and EEG have been used to provide more information about the brain structures involved in the process of empathy. fMRI and PET have been the main neuroimaging techniques. Based on these neuroimaging and EEG studies, researchers have reached a consensus that it is not the whole brain that is involved in empathy (Frith & Frith, 2003), but around ten interconnected regions. The medial prefrontal cortex MPFC is a centre for processing social information and is essential for being able to compare one's own perspective to an observed other's (Amodio & Frith, 2006; Mitchell, Macrae, & Banaji, 2006; Oschner et al., 2005). Phineas Gage, the railroad worker who survived an iron rod being driven through his skull, is a famous case in neuroscience and provided more evidence for the role of the MPFC in empathy (Baron-Cohen, 2011). Other areas of the brain involved in empathy are the orbito-frontal cortex (OFC; Baron-Cohen et al., 1994; Stone, Baron-Cohen, & Knight, 1998), the frontal operculum (FO; Shamay-Tsoory, Aharon-Peretz, & Perry, 2009), the caudal anterior cingulate cortex (cACC; Hutchinson et al., 1999), the anterior insula (AI; Craig, 2009; Singer et al., 2004), the temporo-parietal junction on the right side (RTPJ; Saxe & Kanwisher, 2003; Scholtz et al., 2009), the posterior superior temporal sulcus (pSTS; Campbell, 1990), the somatosensory cortex (SMC; e.g. Keysers, Kaas, & Gazzola, 2010), the inferior parietal lobule (IPL; e.g. Rizzolati & Craighero, 2004), and the amygdala (e.g. Lee & Siegle, 2009; Wager et al., 2008).

2.4.2 The Development of Empathy

Early theorists suggested that young children were too egocentric or not cognitively able to experience empathy (Freud, 1930/1961; Piaget, 1932). However, many studies have since provided evidence that very young children are capable of displaying a variety of rather sophisticated empathy related behaviours (Zahn-Waxler et al., 1979; Zahn-Waxler et al., 1992a; Zahn-Waxler et al., 1992b). Measuring empathy in very young children is challenging because of their limited verbal communication.

2.4.2.1 Genes for Empathy: Twin Studies

Genes cannot code for a construct such as empathy, Nevertheless, there must be a genetic component to empathy. Nearly all the studies of empathy in twins have found that there is a greater correlation on empathy measures for genetically identical, monozygotic, twins compared to non-identical, dizygotic, twins (Davis, Luce, & Kraus, 1994; Loehlin & Nichols, 1976; Matthews et al., 1981). In terms of the cognitive and affective components of empathy, the heritability of affective empathy has been estimated at 68 per cent. However, one study examining heritability of cognitive empathy, or theory of mind, found that monozygotic and dizygotic twins were quite similar, suggesting environment rather than genetic factors are responsible (Hughes et al., 2005). One method of measuring empathy in young children is for the child's primary caregiver to pretend to cut their finger and to observe how the child responds. Such studies have suggested a strong genetic component to empathy (Zahn-Waxler et al., 1992; Knafo et al., 2008). Displaying personal distress in response to another's experience of diistress during infancy is thought to be a precursor to empathic concern (Hoffman, 1975; Zahn-Waxler & Radke-Yarrow, 1990).

2.4.2.2 Childhood Development

By the age of 4 or 5, children are generally capable of taking another's perspective, as demonstrated by their being able to pass a false belief test. These tests are frequently used as an indicator of theory of mind development (Baron-Cohen, Leslie, & Frith, 1985). False belief tests usually present a scenario with two characters, during which one of the characters places an item in a given location and leaves the room. The second character then arrives and moves the item to a new location. When the first character re-enters the room, the child taking the test is asked where the first character will look for

the item. If the child has developed a theory of mind, he or she should respond with the item's original location rather than the new location, demonstrating that he or she is able to see the situation from the perspective of the first character, rather than the overview of the second (Wellman et al., 2001).

This stage of development in theory of mind as indicated by performance in the false belief test is similar across cultures, although there is some discrepancy in the timing of the development (Liu et al., 2008). The ability to understand others' perspectives is vital to be able to successfully identify another's experience. Theory of mind helps to transform the early developing affective experience of empathy, as demonstrated in the affective response to the personal distress of a known adult, into an other-focussed experience. The development of this ability to identify with another's experience also allows children to engage in more effective helping strategies, as they begin to be able to view a situation more accurately. For example, if a child sees a friend crying, affective empathy may motivate the child to want to help, but it is the cognitive component of empathy that may allow the child to recognise that their friend is sad and may need to be comforted. In his research into the development of individuals with zero degrees of empathy, Baron-Cohen (2011) has highlighted certain aspects of infancy and childhood which appear to be crucial to the development of empathy. He found that individuals who had suffered early developmental trauma (through parental rejection or abuse), early experiences of stress, or excessive admiration or praise (in the case of narcissists) were more likely to have impaired empathy development.

2.4.3 The Role of Empathy in Altruism

de Waal (2008) has argued that empathy is the evolutionary mechanism that motivates altruistic behaviour and prosocial behaviours more generally. Empathy may motivate altruistic, other-focussed helping behaviours. Alternatively, prosocial or altruistic behaviours may be motivated by a desire to reduce the negative arousal induced by viewing another's distress. Research has attempted to distinguish between these different motivations by assessing individuals helping behaviours when they witness a person in distress, where an easy escape from the distressing situation is or is not possible (Batson et al., 1988; Dovidio et al., 1990; Stocks et al., 2009). Participants in these studies tended to help the person in distress, regardless of ease of escape, supporting the theory that it is empathy that promotes prosocial or altruistic behaviours

(Batson et al., 1988; Dovidio et al., 1990; Stocks et al., 2009).

2.4.4 Empathy Accuracy

Empathic inference, as defined by Ickes (2009), is the everyday mind-reading that people do when they attempt to infer others' thoughts and feelings. It is another way of describing mentalising or theory of mind, as outlined previously. Empathic accuracy is the extent to which empathic inference is successful (Ickes, 1997, 2003). Rogers (1957) was the first person to allude to the concept of empathic accuracy with his term "accurate empathy" which he used to describe a clinician's ability to correctly infer a patient's thoughts and feelings from one moment to the next. It was empathic accuracy that Ickes (1993, 2001) was attempting to measure in the video-tape task described above. Using video-tape methods such as those, researchers are able to measure an individual's level of empathic accuracy by comparing the perceiver's empathic inferences of what the target person may be thinking or feeling, to the corresponding responses that the target person actually reported. These video-tape tasks form the standard paradigm for measuring empathic accuracy. As such, empathic accuracy research offers empathy researchers a means of capturing people's actual ability to infer what others are thinking or feeling, rather than just their self-perceived ability.

In the area of clinical psychology, research has addressed how empathic accuracy may be enhanced to improve clinicians' understanding of patients' thoughts and feelings, as well as to investigate the role of empathic accuracy in a number of psychological disorders. With regard to the former aim, the benefits of a feedback method to facilitate the improvement of empathic accuracy were discovered (Marangoni et al., 1995; Barone et al., 2005). Perceivers who were given feedback on a client's actual thought or feeling showed improved empathic accuracy in subsequent empathic inferences compared to those who were not given feedback. A deficit for empathic accuracy has been found for individuals with ASCs (Roeyers et al., 2001). Individuals with borderline personality disorder showed no disadvantage for empathic accuracy, but were themselves difficult to read because their own thoughts and feelings were atypical (Flury, Ickes, & Schweinle, 2008).

By manipulating video footage to systematically remove different information channels, Gesn and Ickes (1999) and Hall and Schmid Mast (2007) were able to determine that verbal information had the greatest effect on empathic accuracy.

Interestingly, the loss of visual information had a negligible effect. These results present some important future directions for cognitive psychology research in empathic accuracy, which may examine how perceivers are able to infer others' thoughts and feelings from the specific words they choose and the way these are combined in speech.

Developmental studies have shown that mothers' empathic accuracy for their children played an important role in their relationship, and was disadvantaged in mothers who had experienced separations from their child (Crosby, 2002). Gleason, Jensen-Campbell, and Ickes (2009) found that children with lower empathic accuracy were more likely to have been the target of bullying and were more likely to suffer from depression and unhappiness. The negative effects of lower empathic accuracy in children was often mitigated by good-quality peer relations. The researchers were able to conclude that empathic accuracy plays a direct role in the personal and social development of adolescents.

2.4.5 Gender Differences in Empathic Responding

Macoby and Jacklin (1974) conducted an extensive review of empathy research literature and concluded that there were no gender differences for empathy. However, their definition for empathy was rather broad and included a number of behaviours that are not typically included in definitions of empathy. Hoffman (1977) reviewed studies of children's empathy and concluded that girls displayed greater empathy than boys, although this greater capacity for empathy was less distinct for the cognitive component of empathy. Eisenberg and Lennon (1983) undertook a further review and found a reliable difference in favour of women in studies involving self-report methods. However, this advantage was not apparent or was unreliable in studies using more objective, physiological methods. The researchers concluded that the apparent female advantage could be due to social desirability and demand characteristics. Women may feel that they are expected to exhibit greater empathy and so they self-report greater levels of empathy.

Almost all self-report measures of trait empathy have found a gender difference for empathy in favour of women. Women have been reported to score higher than men for all subscales of the IRI (Davis, 1980), with the gender difference being greatest for empathic concern (Derntl et al., 2010; Mestre et al., 2009; Rueckert, Branch, & Doan, 2011) and for personal distress (Yang et al., 2009). Elsewhere, results have shown that

women score higher on the EQ and men score higher on the Systemizing Quotient (SQ; Baron-Cohen et al., 2003; Baron-Cohen, 2011). For self-report measures of empathic accuracy, the results of the Reading the Mind in the Eyes test have shown a significant female advantage for neuro-typical adults in the original test (Baron-Cohen et al., 1997), but not for the revised version of the test (Baron-Cohen et al., 2001). Ickes, Gesn, and Graham (2000) found a significant female advantage for the Empathic Accuracy video test. As Rueckert (2011) points out, these tests of empathic accuracy, though arguably more objective than self-report measures of trait empathy, measure the more cognitive component of empathy, rather than a participant's affective response to an observed other. There is also evidence that the female advantage may be based on motivational effects (e.g. Ickes et al., 2000; Thomas & Maio, 2008). Thomas and Maio (2008) found that female participants performed better when they were told that women were not expected to do better.

A number of studies have found greater empathy in girls than in boys. Bryant (1982) developed the Empathy Index for Children and Adolescents and results have shown that girls score higher on this scale than boys (de Wied et al., 2007; Mestre et al., 2009). Girls have also scored higher than boys on the IRI (Mestre et al., 2009) and on the children's version of the EQ (Auyeung et al., 2009). Regarding empathic concern, girls were more likely than boys to express concern and show helping behaviours when their primary caregiver pretended to be in pain (Volbrecht et al., 2007).

A number of physiological studies have supported a female advantage for empathy, but they also suggest that this advantage is not universal and may only appear under limited conditions. For example, one study found that men displayed less empathy than women when viewing a person in pain, but only when that person was perceived as having been unfair (Singer et al., 2006). In the area of mirror neuron responses, some limited evidence has suggested that women show greater facial mimicry than men for facial expressions (Dimberg & Lundquist, 1990). However, the majority of mirror neuron studies have shown no such gender advantage.

From the evidence of existing studies, a clear conclusion that women have an advantage for empathy over men seems unwarranted. Whilst many studies have reported a gender difference, some have reported no difference, and others have reported that the female advantage only exists under certain conditions. That the female advantage appears most prominent in self-report measures of empathy suggests that the influence of social desirability, expectation, or motivation, as suggested above, may be

to blame. It is possible that a gender difference exists, but only under certain circumstances. So far, contextual effects on empathy have been examined in only a few studies (for a review, see de Vignemont & Singer, 2006). For a full review of literature examining gender differences in empathy, see Rueckert (2011).

2.5 NEUROSCIENCE: MIRROR NEURONS, C. 1995 ONWARDS

Over the last couple of decades much research has focussed on the discovery and subsequent fascination with mirror neurons as a possible neural basis for empathy. Rizzolati and a team of researchers discovered mirror neurons in macaque monkeys. Neurons in the macaque premotor cortex were found to fire both when the monkey was performing a particular action, and also when the monkey was watching that action being performed by another animal or a human. The mirror neuron system has been found to exist in humans as well (Gallese et al., 1996). Motor mirroring has been established for sound as well as for vision (Kohler et al., 2002) as well as for sensations and emotions (de Vignemont & Singer, 2006; Gallese, 2001, 2003a, 2003b, 2006; Keysers et al., 2004). In particular, evidence has been found for mirroring for pain (Botvinick et al., 2005; Hutchison, et al., 1999; Jackson, Meltzoff, & Decety, 2005; Singer et al., 2004; Ebisch et al., 2008) and touch (Blakemore et al., 2005; Keysers et al., 2004). Regarding emotions, disgust was the clearest case for mirroring (Wicker et al., 2003). These results altogether suggest that our capacity to empathize with others is mediated by embodied simulation mechanisms, that is, by the activation of the same neural circuits underpinning our own emotional and sensory experiences (see Gallese, 2005a, 2005b, 2006; Gallese et al., 2004).

It has been argued that the mirror neuron system provides the neurological basis for empathy (e.g. Gallese, 2009). He suggests that the mutual resonance of sensory-motor behaviours found in mirror neuron responses is an example of intercorporeity – a fundamental element of simulation and closely linked to even the earliest conceptualisations of empathy through the notion of embodiment. Embodied simulation through the mirror neuron system, argues Gallese, mediates our capacity to share our intentions, actions, and feelings with others. The perception–action model of empathy (Preston & de Waal, 2002) posits that perceiving emotion activates the neural mechanisms responsible for generating emotions. This is consistent with the theory of simulation, which involves an observer attempting to replicate, imitate, or impersonate

the mental state of an other (Gallese & Goldman, 1998). There is also growing evidence that emotional empathy or contagion requires the mirror neuron system to create links between self and other (de Waal, 2008).

Husserl, Stein, and Merleau-Ponty each considered an embodied aspect for empathy. In *Ideen*, Husserl explains: "In order to establish a mutual relationship between myself and an other, in order to communicate something to him, a Bodily relation… must be instituted… In empathy I participate in the other's positing" (Husserl, 1928/1989, pp. 176–177). In her doctoral thesis, Stein examined the embodied aspect of *Einfühlung* more closely, arguing that our understanding of others is grounded in an appreciation that they are similar beings to ourselves. This is based in the common experience of action. Merleau-Ponty elaborates further on this emphasis on the body, arguing that it is our corporeal commonality specifically which enables the possibility of real empathy. "It is precisely my body which perceives the body of another person" (1945/1962, p. 354). These philosophically grounded conceptualisations of empathy seem to offer some support to Gallese's assertion that the mirror neuron system may provide a neurological basis for empathy.

The discovery of mirror neurons has been significant for three main reasons: we now know that the brain does not function in isolation as a stimulus-response perception-action machine, but its functioning is intimately connected with the body; the brain can interact with and understand other brains; we can now consider social communication in terms of action sequencing, intentions, goals, prediction, and shared representations.

2.6 CONCEPTUALISATIONS OF EMPATHY

So far, this review has examined the development of empathy research from its beginnings in the nineteenth century and conceptual development through the work of the phenomenologists. The related areas of research in sympathy and theory of mind have been outlined, and various key aspects of empathy research from different disciplines across the latter half of the twentieth century have been considered. It may be evident from this brief history that empathy has been studied not only across many disciplines, but for different purposes, and using different approaches. As a result, there are many conflicting conceptualisations for empathy – as Batson (2009) observes "disagreements abound." Some conceptualisations of empathy emphasise a cognitive

component (e.g. Basch, 1983; Krebs, 1975; Neuman, 2010; Wispé, 1986), whilst others recognise only an affective component (e.g. Carlozzi et al., 1995; Eisenberg, Eggum, & di Giunta, 2010; Eisenberg & Lennon, 1983; Eisenberg & Miller, 1987; Wild, Erb, & Bartels, 2001; Zahn-Waxler, 1991).

Batson (2009) has identified eight diverse but related conceptualisations of empathy:

1. Knowing another person's cognitive and affective internal state.
2. Adopting the posture or matching the neural response of another.
3. Feeling as another feels.
4. Projecting oneself into another's situation
5. Imagining the thoughts and feelings of another
6. Imagining how one would feel in another's place
7. Feeling distress at witnessing another's suffering
8. Feeling for another person who is suffering.

Coplan (2011) has advocated a wide recognition by researchers that the conceptualisation of empathy is problematic. She proposes taking a broad view of the topic rather than aiming to agree upon a single, narrow definition for empathy. She argues that for psychological and philosophical discussion of any topic, it is necessary to sharpen the appropriate term in a way that facilitates that particular topic and stance of the researcher. However, it is not necessary that all researchers adopt the same meaning. Taking a very broad definition of empathy amounts to trying to please everybody and is not productive for the progression of research in this area. Coplan (2011) suggests that researchers must be precisely clear what sense of the term is being used by others when they set out claims and arguments, and that they themselves should be clear and sure what they mean by the term when making their own claims and arguments.

Despite being a relatively small area of research, similar disagreements over the conceptualisation of empathy in the field of music also exist. The research presented for this thesis examines empathy in ensemble playing and will seek to develop a definition of empathy in that particular musical context. The remainder of this review will explore existing literature in the area of music and empathy research.

2.7 MUSIC AND EMPATHY RESEARCH

Empathy is fast drawing research attention in the fields of music psychology, music philosophy, and music education. Music is a social activity in which composers, performers, and listeners interact in a variety of different ways (North & Hargreaves, 2008). It is possible that empathy may facilitate these interactions. Broadly speaking, the areas of music and empathy research can be divided into two general categories, namely "development (i.e., research concerned with the development of individuals) and "engagement" (i.e. research concerned with the ways in which individuals engage with music). In reviewing this literature, the conceptualisations of empathy in these various musical contexts and the methods used for its measurement are of particular relevance to the present research.

2.7.1 Development

2.7.1.1 Education

Children's empathy development has been considered in relation to music education. This area of research began in the 1980s with a series of studies by Kalliopuska and colleagues. Kalliopuska and Ruókonen (1986) investigated the role of music education in relation to children's empathy development. The researchers used a self-other perspective-taking definition for empathy in which an individual temporarily puts aside his own point of view to experience the feelings and ideas of another. Their participants were two groups of 15 children. The first group took part in music activities once a week for three months. The musical activities involved listening, playing, musical movement, musical painting, dramatising fairy-tales, and a reflective activity in which the researchers discussed with the children what they had experienced. The programme of activities was designed to try to incorporate cognitive, affective, and kinaesthetic elements of empathy. The second group were a control group. At the end of the three-month period, children's empathy was assessed using the Feshbach and Roe Empathy Test (1968), and the Ikonen-Nylund Test on Sociability.

Results showed that the children in the experimental group scored significantly higher for empathy on the Feshbach and Roe Empathy Test than did the children in the control group. However, there was no difference between groups for the empathy scale of the Ikonen-Nylund Test. The teachers' ratings of the children's prosociability showed that the children in the experimental group scored higher. The researchers concluded

that the music programme had had the effect of increasing children's empathy and prosociability. A follow-up test a year later with the same pariticipants and using the same measures revealed that the difference between the groups had become non-significant (Kalliopuska & Ruokonen, 1993). The researchers concluded that the music programme had been effective in increasing the children's empathy, but that the effects of the programme had weakened over time.

A further study was carried out to examine the effect of instrumental study on children's empathy development (Hietolahti-Ansten & Kalliopuska, 1991). The same definition for empathy was used as for the previous study. There were two groups of participants: a group of 25 children who had played the piano or the violin for six years, and a control group of 30 children who had not. The children completed a modified version of the Mehrabian and Epstein Empathy Scale and the Battle Self-Esteem Scale – B. Results revealed that the group of children who had been learning an instrument scored high on the self-esteem scale whilst their counterparts scored lower. However, no difference was found between groups for the empathy scales, although girls scored higher for empathy than boys did. These findings were supported by a further study on children's empathy (Kalliopuska, 1991).

More recently, Rabinowitch, Cross, and Burnard (2012) have extended this early research into children's development of empathy by investigating the relationship between Musical Group Interaction (MGI) and the development of emotional empathy in children. A MGI programme was designed for primary school children, consisting of various interactive musical games. The programme was delivered for one year and then empathy was assessed for the children who had taken part and compared to that of children who had not. There were three groups of participants. One group who took part in interactive musical games, one group who took part in similar games without a musical component, and third group who did not take part in these extra sessions at all. Empathy was measured using Matched Faces and Index of Empathy (Bryant, 1982) as a pretest before the study. Empathy was measured at the end of the study using the same two tests and a memory task. Results showed that children who had participated in the programme scored higher than they had done before the programme, and had higher scores than the control children for two out of three of the tests. These results lend support to the researchers' initial hypotheses that empathy development in children may be increased by involvement in MGI activities. These findings also support the findings of Kalliopuska et al. (1986). However, unlike that earlier study, Rabinowitch and

colleagues did not measure the children's empathy again at a later point to determine whether the apparent effect of the MGI programme lasted far beyond the duration of the programme.

2.7.1.2 Shared Affective Motion Experiences

Molnar-Szakacs and Overy (2006) have proposed that the human mirror neuron system, through its ability to integrate and represent crossmodal information, may provide a mechanism for processing combinatorial rules common to language, action, and music, which can result in the development and communication of meaning and human affect. They have developed the Shared Affective Motion Experience (SAME) model which suggests that "musical sound is perceived not only in terms of the auditory signal, but also in terms of the intentional, hierarchically organised sequences of motor acts behind the signal" (Overy & Molnar-Szakacs, 2009, p. 492). The researchers propose that music can provide an auditory representation of the presence of another person or social group. In the case of music-listening, the SAME model suggests that music provides a strong sense of an agent or agents – one is not alone when one listens to music. Further evidence for this argument has been provided by Launay and colleagues (2013; in press) and offers an explanation for what he terms the "iPod Paradox." In the context of group musical performance, the SAME model suggests that there is the potential for synchronised, affective experience and communication. Overy and Molnar-Szakacs (2009) argue that it is this quality of music to communicate social and affective information and to create the feeling of "being together" that make it so appealing to humans. Although the SAME model has yet to be applied specifically to ensemble performance, it seems possible that it may provide a useful framework for considering co-performer interaction and the role of empathy.

A later study by Kirschener and Tomasello (2010) has provided further evidence for the SAME model, and suggests that shared experiences of musical interaction may result in the development of greater empathic concern, or prosocial behaviour. The researchers found that pairs of children who participated in a joint musical activity, particularly involving rhythmic synchronisation, were more likely to exhibit helping behaviours than pairs of children who had participated in a non-music joint activity. It is possible that it is the rhythmic synchronisation element of the musical interaction in particular that contributes to the shared affective motion experience, and this may be an interesting aspect for exploration in the area of empathy and ensemble playing.

Research relating to the SAME model seems to belong in both the development and engagement categories of music and empathy research.

2.7.2 Engagement

2.7.2.1 Listening and Music-Induced Emotions

Over the last ten years, a large body of research has been dedicated to examining emotional expression and emotional responses to music. Studies have suggested that listeners value music partly for its ability to evoke emotions. However, it is still unclear which emotions listeners experience when they listen to music, or how these emotions are caused. Recent studies have incorporated measures of self-reported empathy to explore the relation between music-induced emotions and trait empathy (Garrido & Schubert, 2009; Vuoskoski & Eerola, 2011).

Garrido and Schubert (2011) investigated the people's enjoyment of listening to sad music. 59 student participants completed a questionnaire with items examining empathic concern, music empathy, absorption, fantasy proneness, rumination, and dissociation. Results showed that half of the sample enjoyed experiencing negative emotion in music to a certain degree. There was no conclusive answer to the research question, although "absorption" was the component in this study most likely to predict enjoyment of sad music. Those who tend to experience states of absorption were more likely to enjoy negative emotions in music than those without. Music empathy also correlated strongly with enjoyment of sad music.

More recently, Vuoskoski, Thompson, McIlwain, and Eerola (2012) have investigated the kinds of subjective emotional experiences that can be induced by listening to sad music, and whether the tendency to enjoy sad music might be associated with particular personality traits. 148 participants listened to 16 musical excerpts and rated their emotional responses. Participants also completed the Big Five Inventory (BFI; John & Srivastava, 1999) to assess their openness to experience, and the IRI to assess their trait empathy. Analysis revealed that two traits: openness to experience and empathy, were associated with liking for sad music and with the intensity of emotional responses induced by sad music. The researchers speculated that these results suggest that aesthetic appreciation and empathic engagement play a role in the enjoyment of sad music.

Exploring listener empathy with a performer, Miu and Balteş (2012) combined

self-report measures of trait empathy and affect with physiological measures of heart-rate, skin conductance, and respiration. The aim of the study was to test the causal relationship between music-induced emotions and empathy. There were two empathy conditions: low empathy and high empathy. For the high empathy condition, participants were instructed to empathise as closely as possible with the performer. For the low empathy condition, participants were asked to remain as detached as possible. The general hypothesis was that, in comparison to the low empathy condition, the high empathy condition would increase music-induced emotions and physiological activity. Considering that multimodal displays of music that incorporate facial expressions, gestures and body postures as well as sounds may facilitate empathy with the performer, video recordings of the two music pieces performed in concerts were used. The high empathy condition was associated with significantly lower GSR and significantly higher RR than the low empathy condition. No effect of the empathy manipulation was reported in relation to heart rate. This study is particularly significant, since it was the first in any area of music and empathy research to involve physiological measures rather than self-report measures alone. The significant results for skin response and respiration in relation to empathy suggest that future work in all areas of music and empathy research may employ physiological responses in combination with self-report measures.

In the area of music philosophy, Davies (2011) has argued that a listener's response to emotion in music is a mirroring response brought about by emotional contagion. Davies identifies two types of emotional contagion relating to music listening. The first is when music is heard but not actively listened to, background music in lifts for example. Any change in mood is not appreciated, and the source is not recognised. The second type of emotional contagion relating to music listening is when music is the object of attention and is recognised as the source of the response it evokes. Peters (in press) has considered listener empathy in more detail in terms of the way in which listening to music can allow us to experience emotions that are not our own. He distinguishes between musical and social empathy, and rejects the idea that the listener is empathising with either the composer or the performer. He argues that musical perception is doubly active: that bodily knowledge can extend auditory perception cross-modally and that that upon hearing sounds not actually made by us, our "corpophonic" knowledge (embodied tactile-sonic knowledge) can make itself felt actively in what we hear. He goes on to consider that a listener's empathy is with a

"musical other" that comes into existence through the attribution of the emotional ownership to an imagined agent that is not the listener. Peters explains that once the ownership of a co-constituted emotion is decidedly that of an imagined agent, the listener can begin to shift perspective towards the musical other. In a broader context, Peters suggests that this musical empathy is supported by, and in turn supports, social empathy with those factually or imaginatively involved in the musical activity – ensemble playing, for example.

Aside from research on music-induced emotions and empathy, other work has examined the relationship between empathy and observers' perception accuracy of performers' intended expression. Wöllner (2012) examined perceptions of emotional expression in music and related these to cognitive and affective empathy. A student string quartet was video-recorded during a performance. Around three months after their performance, each member of the quartet was asked to rate the expressiveness that they were individually conveying. They were asked to rate continuously the expressiveness of the performance across three different conditions. 22 musically trained independent observers then carried out the same task. Following the task, the 22 observers completed the Questionnaire of Cognitive and Affective Empathy (QCAE; Reniers al., 2011). Results found that for one or two parts of the music, observers with higher affective and overall empathy scores were more accurate at estimating the musicians' intentions. Wöllner concluded that whether emotional contagion is part of empathy or a separate phenomenon, it plays in a role in responding to music performances and in estimating musicians' intended emotional expressions.

Greenberg, Rentfrow, and Baron-Cohen (2013; in press) have examined the relationship between music preferences and empathy through the framework of empathizing-systemizing theory (E-S Theory; Baron-Cohen, 2003; 2009). Two internet samples (N=3,169 and N=1,332) provided preference ratings for separate sets of 25 musical excerpts, along with ratings on the Empathy Quotient scale (EQ; Baron-Cohen & Wheelwright, 2004) and a Big Five personality measure. Analysis revealed a significant relationship between EQ score and musical preference ratings, which was independent of gender and the big five personality trait, Agreeableness. Specifically, participants with high EQ scores preferred music that was Mellow, Unpretentious, and Sophisticated, while those with low EQ scores preferred music that was more Intense. The researchers assert that by understanding how E-S theory explains individual differences in musical experiences, the ways in which music may increase empathy and

reflective functioning, in both the general population and in individuals with ASCs, may be better understood.

2.7.2.2 Hearing and Motor Empathy

Launay, Dean, and Bailes (under review) have argued for a process of "motor empathy," occurring when individuals empathically engage motor regions of the brain in response to hearing sounds associated with intentional human movement. Mirror neuron research has shown that when we see the intentional movements of another person, we process these using regions of the brain that would be involved in performing those movements ourselves. Launay and his colleagues have conducted a series of experiments whose results suggest that the intentional sounds of another person, as occur in music, are also processed using motor regions of the brain (in press). When participants believed they were engaging with a non-intentional computer agent, a relationship between synchrony and affiliative behaviour was not observed. The researchers have suggested that a possible explanation for this finding is that sounds that are not associated with intentional human movement do not empathically engage motor regions of the brain.

Another experiment investigated this phenomenon further by training participants to associate computer sounds with human movement (Launay, Dean, & Bailes, in press). When subsequently listening to these sounds, participants who had learnt to associate them with human movement displayed greater motor empathy for these sounds. A further experiment found that synchronization with sound can have a social effect if the sounds are human-driven (2013). The evidence provided by these experiments suggests that believing that human agents intentionally create sounds leads to them being empathically acted out in motor regions of the listener's brain. It could also explain what Launay (2013, in press) has termed "the iPod paradox": despite research showing music to be a social activity, people enjoy listening to music in isolation on iPods and personal music players. If listening to music is inherently social, then there is no iPod paradox.

2.7.2.3 Singing and Embodying a Character

In the area of music performance, Heisel (in press) has explored a singer's use of an empathic process as a means of identifying with and portraying a character. Heisel has proposed a reflective process for the development of these empathic skills in young singers, through the keeping of a role journal. Heisel recommends a set of guided

questions for a student singer to consider as he or she prepares for a new role, that should also include basic biographical information about the character. The student singer should also consider how the character interacts with others, their emotions and experiences, information about the character that can be gathered from the music or the text. Heisel suggests that students should begin to consider this information as soon as they pick up a new score and should be in the habit of reconsidering the information as their understanding of the character grows. Research in the related area of theatre has considered the ways actors empathise with the characters they embody (e.g. Goldstein & Winner, 2012) and in the area of psychology education research in the way that clinicians might empathise with their patients (e.g. Poorman, 2002).

2.7.2.4 Empathy and Conflict Resolution

In addition to her extensive work exploring the conceptualisation of empathy (e.g. Laurence, 2008, 2013), Laurence has examined empathy through Small's concept of "musicking" (Small, 1998) to examine what it is that humans do when they "music." It is Small's positioning of relationships at the core of his concept of musicking, argues Laurence (2008, 2013), which offers a direct conceptual link to empathy, and Laurence has applied these concepts of empathy and musicking to children's joint musical interaction in a cross-cultural context (2013). She undertook some ethnographic work in a small village in the Occupied West Bank, where she facilitated small-group musicking with Palestinian and Israeli children. Reflections from the children themselves on their musical encounter, as well as Laurence's insights, have suggested a distinction between a musical empathy, specific to the context of the shared musical experience, and a more generalised concept of empathy. Laurence concluded that although these two empathies might be related, the context-specific musical empathy could not be extrapolated into a general empathic process beyond the transient musical moment.

2.8 EMPATHY IN ENSEMBLE PLAYING

Over the last few decades research in ensemble playing has become more prevalent. Almost all musicians play, rehearse, or perform with others at some point, whether in choirs, orchestras, bands, or small chamber groups. Music psychologists have sought to understand ensemble musicians' interactions, both social and musical (e.g. Davidson & Good, 2002; King, 2004), and how they communicate verbally and non-verbally in

rehearsals and performance (e.g. King & Ginsborg, 2011). Keller (in press) has suggested that empathy is an important aspect of ensemble playing. It is possible that empathy may play a key role in the working processes of ensemble musicians and may be central to our understanding of social and musical interaction within performing ensembles.

Myers and White (2011) conducted a study examining the parallels between the role of empathy in ensemble musicians' performing experiences and the role of empathy in the clinical therapeutic process. Nine professional musicians from a variety of genres gave written accounts of their performing experiences. They were asked to include descriptions of musical relationships, qualities they seek in co-performers, the highlights of particularly positive or negative experiences, the impact of performance experiences on relationships, parallels between performance relationships and interpersonal dyads, and their experiences of empathic connections in those relationships. The accounts were then analysed and three themes relating to empathy were revealed. "Striking a chord: Empathic connection," "Staying in tune: The working relationship," and "Making music: The therapeutic process." The researchers found many parallels between empathy as experienced in musical relationships and empathy as it is experienced in clinical therapeutic relationships between therapist and patient. In terms of empathy, analysis revealed that a relationship characterised by an empathic connection was critical for ongoing collaboration in music endeavours. Listening and responding were identified as important for maintaining an empathic connection. Some participants also identified an empathic connection between musicians and the audience. Although the role of empathy in ensemble playing was not specifically examined in this study, the musicians' responses suggested that empathy was key to the long-term success of a working relationship, and was important for the high-level functioning of a group.

Seddon (2005) and Seddon and Biasutti (2009) have both examined co-performer interaction in ensemble rehearsal and performance. Seddon (2005) studied the rehearsal behaviour of a student jazz sextet to investigate whether or not they were able to empathetically attune when playing together. Verbal and non-verbal communication were analysed qualitatively and three modes of communication were identified: instruction, cooperation, and collaboration. The verbal mode of instruction applied to examples of verbal communication where a member of the group gave specific verbal instructions on how a pre-composed section of a piece should go,

without any discussion. The non-verbal mode of instruction applied to examples of non-verbal communication where one player demonstrated through playing how a particular passage should be played. The verbal mode of cooperation applied to examples of verbal communication where musicians discussed organisation points of the music in a democratic manner. The non-verbal mode of cooperation was exemplified by moments where focused on ensemble cohesion and involved the achievement of what Seddon terms "sympathetic attunement." The verbal mode of collaboration involved moments where the players discussed creative ideas. The non-verbal version of that mode concerned creative exchanges during musical interaction and required the players to achieve "empathetic attunement" in order to produce moments of "empathetic creativity." Seddon and Biasutti (2009) undertook a similar study with a professional string quartet and found similar results.

Empathetic attunement as conceptualised by Seddon described moments when players took risks with musical phrasing, timing and dynamics, and in so doing they challenged one another's musical creativity. It was visually evident in expressions of interest (e.g., smiles, collective affirmative nodding and animated body movements) and was musically evident in the production of a more animated performance. From time to time this more animated, risk-taking performance could result in the production of novel variations of interpretation, these moments were defined as moments of empathetic creativity. In this way, empathetic attunement was determined to be a prerequisite for empathetic creativity. Seddon suggests that also essential for empathetic creativity are processes of "decentering" and introspection.

In the context of piano duet rehearsal, Haddon and Hutchinson (in press) have investigated the role and functions of empathy in facilitating social and musical interaction. The two pianist-researchers used a reflective writing method in which they kept a shared reflective rehearsal diary over the course of a four-month period. Analysis of some 15,000 words of reflections revealed that there were several functions of empathy during piano duet rehearsal. The researchers did not produce a definition of empathy for the context of ensemble rehearsal, but instead sought examples of cognitive, affective, verbal, and physical empathy in their interactions with one another. The researchers were able to give two examples of empathy development during the early stages of their rehearsals together. The first was a recognition and acceptance of their different styles of gesture. This acceptance contributed to the formation of trust between the two players. The second example concerned use of the pedal. The way in

which they were able to negotiate the control of the pedal also contributed to the development of trust and empathy between the players in the early stages of the rehearsal process.

Empathy had three main functions as a facilitative tool. The first function was for the construction of shared concerns, which included creating a shared conception of the musical material, as well as agreeing on the approach to the research process and the writing of the shared reflective diary. The second function concerned the socio-emotional role of empathy within the rehearsal process. The players noted examples of "levelling" of their relationship which had previously been a student-teacher relationship. Empathy operated as a regulatory device to stabilise and reinforce the duo partnership. The third function was for the pre-emptive resolution of conflict. Empathy provided a positive way to discuss and resolve issues of divergence and fostered greater self-awareness.

Two key concepts emerged from the analysis of the functions of empathy. The first was the fluidity of roles. The researchers emphasise the fluid nature of duet rehearsal, in which each player "enters into the private musical world of the other" (p. 10) and as a result of the shared processes this entails, they argue that neither player is solely leader or follower, student or teacher. Each player embodies many roles throughout the rehearsal, moving from one to the next fluidly. The second key concept is that of creating a "safe space." The researchers reflected that this safe space was reinforced through the shared reflective process of the diary creation, which supported the development of trust between players. As a result of the safe space, both players felt free to take risks, experiment, and make mistakes, without fear of embarrassment. The researchers conclude that empathy has an important role to play in rehearsals, contributing to the creation of an equal, liberal, and open atmosphere and to the development of creative musical interpretations.

2.9 CONCLUSION AND RESEARCH QUESTIONS

The existing studies of empathy in ensemble playing reported here agree that empathy seems to be important for the long-term functioning of an ensemble, and that it is an essential facilitative tool for social and musical interaction during the rehearsal process, and in performance. The optimal experience literature reviewed in the previous chapter suggested that players' optimal experiences of ensemble performance tended to feature

a collective state of mind between co-performers that may be a result of shared empathic processes in rehearsal and performance. Since optimal experiences of performance have been found to be both important and desirable, and since the existing literature indicates that co-performer empathy may be a feature of these optimal experiences, as well as being central to social and musical interaction in ensemble playing, the process of co-performer empathy and the role it plays in ensemble playing and optimal experiences of ensemble performance needs to be investigated. No research on empathy and ensemble playing to date has focussed on identifying the components of co-performer empathy or constructing a process for co-performer empathy empirically, and the relationship between empathy and musicians' optimal ensemble performance experiences is yet to be explored. Existing studies have used a variety of self-report methods for measuring empathy in ensemble playing, including reflective accounts, observations with member checks, and free-written accounts, but so far none have used more objective measures.

This thesis will, therefore, address the following research questions:

1. What is the relationship between ensemble musicians' experiences of optimal experience and their experiences of co-performer empathy?
2. How do ensemble musicians describe co-performer empathy?
3. What is the process of co-performer empathy?

In the Introduction to Part II, the research methodology is considered in relation to these research questions, prior to the presentation of the empirical work undertaken as part of this thesis in the ensuing chapters.

PART II: EMPIRICAL STUDIES

CHAPTER 3. METHODOLOGY

In this chapter my research methodology and techniques will be outlined and considered in relation to my research questions and the aims of my research. Finally, concepts of reliability and validity relating to the research undertaken here, as well as the ethical considerations will be reflected upon.

3.1 EPISTEMOLOGY

Empirical research within the domain of social science often favours objective, quantitative methods in the positivist paradigm. Taking a positivist stance, researchers seek to understand social reality as an objective entity. In this way, data about humans and their experiences of the world is seen as existing independently and as unconnected to the researcher collecting them. However, this quantitative approach to social research has been criticised for being incapable of examining important aspects of human lives and social realities (e.g. McCracken, 1988).

The research presented here is informed by a social constructionist view of knowledge creation. The key characteristic of a social constructionist approach is a critical stance toward knowledge. It suggests that there is no objective truth waiting to be discovered, but that truth or meaning comes into existence through our engagement with the realities of the world. Furthermore, people continuously interpret reality, which changes through social interactions and through experiences (Crotty, 1998). Social constructionist research tends to focus on social interaction (Creswell, 2003), and is primarily concerned with understanding the processes by which people come to describe, explain, or account for the world in which they live (Burr, 2003). Given that my research questions seek to understand the way expert musicians describe and experience phenomena that arise during ensemble rehearsal and performance, a social constructionist view of the way meanings are constructed seems to be most appropriate.

Another feature of the social constructionist view of research is the recognition that the researcher is part of the system studied (Creswell, 2003). Since I have collected and interpreted the data for the studies reported here, my perceptions, history, and biases will influence, to some extent, the interpretation of the meanings I find in the data. In my case, I am a classically trained musician with a masters degree in solo performance

from a UK conservatoire. I also work and perform regularly with chamber ensembles and orchestras. My research investigates the experiences of expert ensemble musicians. As an active ensemble musician myself, the way I have engaged with my research questions, the process of data collection (particularly with regard to the interviews), and the interpretation of the data has inevitably been influenced by my personal perspective and history.

3.2 METHODOLOGY

A phenomenological approach was taken to study the experiences of expert ensemble musicians in terms of co-performer empathy and optimal experiences of performance. Husserl (1913/1962) suggested using what he calls phenomenological reductions as a means to secure a foundation of knowledge, in order to grasp the essence of things. In developing Husserl's philosophy and applying it to social research, Schütz has argued that the researcher should start with the "life-world," where a participant acts within the natural attitude, which they themselves take for granted (Schütz, 1966/1975). This approach was chosen here to allow the collection of rich qualitative data, and to provide deep insights into the perspectives and perceptions of the participants on their "lived experiences" of working and performing together.

3.3 METHODS

A key requirement for empirical phenomenology is that explanation must account for participants' "first-order constructs" – the participants' meaning level, rather than the researcher's. This means that while the research may employ various methods, these must preserve the subjective perspective. The empirical phenomenological approach requires verbal interaction with the participants being studied. Meaning is primarily transmitted by words, and so interviews are the most suitable method for this kind of qualitative research (Schütz, 1932/1976). Words also assume meaning in interaction and practical work, and so there are benefits to observing the situation or people studied. According to Schütz's thinking, ideally the researcher should combine interviews and observations. It is easy to misinterpret or fail to gain a full understanding from observations alone. A full understanding demands a combination of observations and interviews (Schütz, 1932/1976). Therefore, the research presented here consists of four

studies: a focus group study, and three observational case studies involving video-recall interviews.

An awareness of the role of the interviewer, as well as the interviewer's effect on the data is an important factor to be considered when interviews are chosen as a method of data collection. Research has suggested that an interviewer and interviewee have a "collective contribution" to an interview (Holstein & Gubrium, 2003) and so the relationship between interviewer and interviewee is important and has an effect on the data gathered. The exact relationship between interviewer and interviewee cannot exactly by controlled by the interviewer, as it is usually dependent on the interviewer's identity – their gender, age, race, education, and so on (Corbin, 1971). The effect of the relationship between the interviewer and interviewee must be acknowledged, since both are constructing themselves and influencing the other in what they say and how they choose to say it (Gillham, 2005). Holstein and Gubrium's (2004) concept of "active interviewing" suggests that all participants in an interview are implicated in making meaning. Pool (1957, p. 193) describes an interview as "an inter-personal drama with a developing plot." This recognition of the role of the researcher as an active participant in the construction and collection of data is in line with the social constructionist approach to knowledge.

Similarly, observational methods can gather immediate data on real behaviour unconstrained by artificial laboratory settings, but the researcher's relationship with the participants, her role in the data collection, and approach to the analysis must be acknowledged, and can affect the quality of the data (Coolican, 2009). In the first two of the three observational studies reported here, the intention was to observe the participants in two natural situations: a private rehearsal and a public performance. The observer was not present in the rehearsal room in order to minimise reactivity effects in that intimate space. These observational case studies, two with a string quartet and the the third with a violin duo, are appropriate given the phenomenological approach of this research. Yin (2009) argues that a case study method is appropriate for a study that examines a contemporary phenomenon in depth and within its real-life context, particularly when the boundaries between the phenomenon and its context are unclear.

3.4 RELIABILITY AND VALIDITY

Reliability is the requirement that empirical research findings be replicable, so that they

are not simply a product of fleeting, localised events. Validity is the requirement that the researcher's description of the world is a true representation of what exists. However, the social constructionist view of knowledge creation does not seek to identify objective facts or truth. There is no final description of the world, and accounts are dependent on social, historical, and cultural contexts. The aforementioned definitions of reliability and validity are, therefore, inappropriate for judging social constructionist research (Burr, 2003). There is, as yet, no universal method for judging the quality of such research. Certain techniques, such as inter-rater reliability checks to calculate indices of agreement between researchers for the coding of transcripts, have been employed. Providing detailed information on the analytical procedure used so that a reader can track the analytic process and assess its efficacy is perhaps another means for judging the quality of the research conducted (Wood & Kroger, 2000). I will be providing detailed descriptions of my data collection and analysis procedures, as well as using inter-rater reliability checks for the coding of my interview transcripts. My observational studies made use of code-specific video-recall methods in which the participants themselves coded their data to minimise researcher bias in the interpretation. To ensure analytical validity, the co-performer empathy model was built gradually as a result of an analysis of several focus group transcripts with different kinds of Western art ensemble, followed by the analysis of three observational case studies with different aims and designs. Different expert participants were recruited for three of the four studies.

3.5 ETHICAL CONSIDERATIONS

Ethical consent for each study was sought and obtained from the University Faculty of Arts and Social Sciences Ethics Committee. Participant anonymity was assured, as well as correct procedures for data handling and storage. For the Study 4, which involved heart-rate measurement, sign-posting to appropriate medical support was put in place in the unlikely event of a heart abnormality being identified. Signed consent was received from all participants.

CHAPTER 4. STUDY 1: INTERVIEWS WITH FOCUS GROUPS

4.1 INTRODUCTION

Since optimal experiences of music performance are important and desirable, research exploring these experiences in ensemble playing is required. Studies indicate that co-performer empathy is likely closely related to ensemble musicians' optimal experiences of performing. The present study is the first of four empirical studies. It aimed to address the first two objectives of this thesis: to construct a model of the relationship between optimal experiences of ensemble performance and co-performer empathy; to identify components of co-performer empathy. It also sought to begin to address the first two research questions: what is the relationship between ensemble musicians' experiences of optimal experience and their experiences of co-performer empathy?; How do musicians describe co-performer empathy?

A focus group study was designed in order to explore in depth expert ensemble musicians' optimal experiences of performance, and the concept of co-performer empathy in rehearsals and performance. There were four aims for this study:

1. To find out how professional chamber musicians talk about and describe their experiences of co-performer empathy and optimal experiences of performance;
2. To identify components of co-performer empathy;
3. To construct a model of the relationship between optimal experiences of expert ensemble performance and co-performer empathy;
4. To identify and explore similarities and differences between the focus groups.

4.2 METHOD

4.2.1 Participants

The members of five established, Western art chamber ensembles (N=19, men=10, women=9, M=36.6 years, SD=16 years) were recruited and interviewed in their respective groups: a wind quintet, a vocal duo, a contemporary woodwind trio, a mixed piano trio, and a string quartet. No brass ensemble was available for a group interview,

so three members of two brass ensembles were interviewed individually. All participants had been working together in their groups professionally or semi-professionally for a minimum of three years (M=16.4 years, SD=17.5 years).

4.2.2 Materials

Interview questions were based, in part, on existing studies on empathy in performance (Myers & White, 2012), peak performance (Privette, 1981), and SEM (Gabrielsson, 2001). The focus group discussion was semi-structured according to three thematic areas: first to find out about the players' optimal experiences of performance; second to explore their experiences of working together more broadly; third to examine their experiences of co-performer empathy (see appendix i for a copy of the interview schedule). *NVivo 9.0* was used for coding and analysis.

4.2.3 Procedure and Data Analysis

All focus group sessions and two of the individual interviews were conducted in person at rehearsal venues. The third individual interview was conducted over Skype. Each focus group session was planned to last around 45 minutes and participants were briefed at the start of the session. The researcher introduced each question, but, probably due to their familiarity with one another, each group seemed comfortable and confident in discussing each of the questions among themselves with only occasional prompting from the researcher. The focus group discussions were transcribed, read and re-read, initial codes were developed, and then the transcripts were imported into *NVivo*. Content analysis was undertaken using an approach modelled on grounded theory, in which the aim of the analysis was to describe the data in order to derive a theory inductively. This process reflected a "coding up" approach (Fielding, 1993), because the aim of the analysis was to describe the data in order to generate theory. Themes were developed by collapsing, combining, or extending initial codes.

4.3 RESULTS AND DISCUSSION

The key themes arising from the focus group discussions are modelled in Figure 4.1, where analysis revealed that expert ensemble musicians perceived their optimal

performance experiences to be a result of co-performer empathy, components of flow, and two performance conditions. Co-performer empathy itself consisted of three main components: a "shared approach" to interpretation and to working together; a "special connection" between players; and an "intentional awareness" of how colleagues are operating on both a musical and a practical level. In addition, it was found that co-performer empathy sometimes led to an ensemble achieving "spontaneous interpretative flexibility" (SIF) during performance. That is, whilst in empathy, players felt able to vary aspects of musical expression spontaneously. Spontaneous interpretative flexibility was described by participants as a central feature of optimal performance experiences.

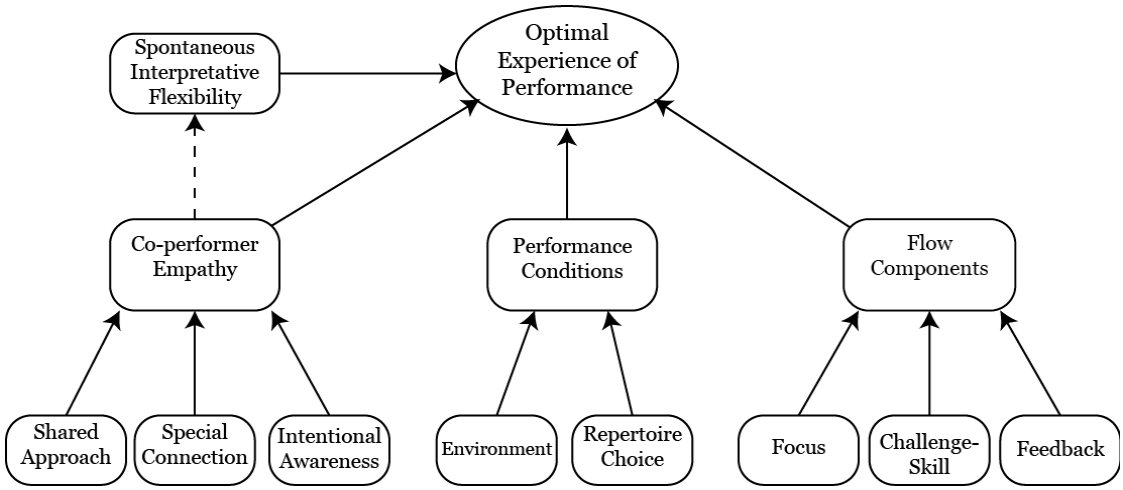

Figure 4.1. Co-performer empathy and optimal experience of performance

The qualitative analysis software, *NVivo,* calculated figures representing the percentage coverage for each ensemble for each component of the model (see Table 4.1). From these percentages it was possible to see the differences between groups in terms of how much they decided to speak on a particular theme. The results revealed that the vocal group scored much higher than the instrumental groups for intentional awareness and repertoire choice; the string quartet scored much higher than the other groups for shared approach; and the mixed ensemble scored slightly lower than the other groups for special connection. The brass percentages shown are the mean of the three brass participants' scores with the standard deviation for each in brackets.

Table 4.1. Percentage coverage of each component for each ensemble

	Empathy				Flow components			Independent Factors	
	Connection	Approach	Awareness	SIF	Challenge	Feedback	Concentration	Repertoire	Environment
Strings	10.91	17.82	5.4	11.04	2.97	5.26	1.28	3.13	3.16
Brass	11.48 (4.44)	6.19 (2.81)	7.13 (4.57)	2.87 (0.8)	2.44 (1.64)	3.00 (2.24)	0.38 (0.65)	1.75 (0.55)	0
Vocal	9.49	4.85	17.44	10.56	5.14	2.84	2.42	9.38	0
Wind	8.14	5.19	5.78	7.57	5.6	2.48	0	1.54	4.46
Mixed	3.17	4.52	8.72	5.18	4.73	6.05	0	0.94	3.46
Trio	11.21	7.82	6.82	1.71	8.46	0.94	1.71	0.83	1.71
Mean	9.07	7.73	8.50	6.49	4.89	3.43	0.96	2.93	2.13

The reproducibility of the coding scheme for co-performer empathy and SIF was tested through an evaluation of inter-rater reliability. A second coder coded 30% of one of the focus group transcripts. For the purpose of inter-rater reliability checks, the transcripts were coded by utterance, demarcated by change of speaker. Testing the codes individually allowed utterances to be coded as more than one code. Cohen's kappa scores were calculated for each component of co-performer empathy and SIF (shared approach: k=0.90; special connection: k=0.69; intentional awareness: k=0.79; SIF: k=1.00), and a substantial agreement was found between coders for every coded component.

The ensuing sections will detail the generation of the model according to the different themes that emerged from the data. First it will focus on co-performer empathy, examining each of its thematic components, as well as the related notion of SIF. Second, it will consider the flow components and performance conditions. Finally, it will examine the overall model for optimal experiences of ensemble performance and highlight similarities and differences across the focus group data.

4.3.1 Co-Performer Empathy: A Pre-Requisite Shared Approach

Three components contributed to co-performer empathy. The first was a shared approach, both to the music and to working together.

4.3.1.1 A Shared Approach to The Music

There were two aspects of shared approach to the music. The first concerned a shared approach to expressive detail within the music. In describing his ensemble's criteria for

selecting new players, the second violinist of the string quartet explained the importance of a shared approach to musical interpretation:

> And the approach to the music as well. It's, I mean you can tell immediately whether you like the sound they're making but there are some things that take a little bit longer to tell, and that's why you'd always have to have a rehearsal, a good length rehearsal with the person, because you then find out how they approach things, and how they would want to work at things, aiming for the same sort of ideas, erm, with some people, you just feel. (Second Violinist, string quartet)

The string ensemble in particular spoke at length about their approach to musical interpretation:

> We tend to try to start on a new piece with a blank sheet – so you know, no preconceptions, simply try to be accurate. But accuracy is not, I mean it's desirable, but it's not the most important thing. I think it's the spirit of the music. I mean, basically what we're always trying to do it, we're always trying to play the music how we think the composer intended it. (First Violinist, string quartet)

A shared approach to musical interpretation was important to them. It was one of their essential criteria for selecting a replacement member for their ensemble. For them it was necessary for all members of the group to approach interpreting the music in a similar way. It seems likely that this would reinforce empathy between the players on a musical level. Three of the groups spoke about the importance of a shared approach to musical interpretation.

The second aspect of a shared approach to the music was an agreement that the music should take priority over all else. This was emphasised by all of the ensembles. One violinist described this second aspect as striving to "make the whole greater than the sum of the parts." The second violinist of the string quartet explained:

> That's not to say that you've not got to be able to play really well like a soloist on your own, but that mustn't be the main reason that you're

> doing it. And I think actually that, going back to your question about "what do you look for?".... We've auditioned people, I mean over the years we've had to find two new cellists, two new viola players, so you know we did try out quite a lot of people erm, and there were some that were good players but you did feel that they were more, more interested in themselves or in their own playing. (Second Violinist, string quartet)

For the string quartet, the whole being greater than the sum of the parts was central to their shared approach to the music. Elsewhere, the flautist of the contemporary woodwind trio described the importance of the music itself to her ensemble:

> I think we're really intuitive in a lot of ways and.... Well, I was thinking, if someone were to replace me, the person would.... I can't imagine it would be someone who's all about "gigs gigs gigs" and achievement. Like, I would want it to be like a musician. And I think that's what's really important to us that it's about the music I think. I hope anyway. And, it's about this kind of thing that we're all discovering together but it's always about the music and it's really not about us as people when it comes to this. (Flautist, contemporary trio)

She felt that her ensemble's view of the music as being the most important element of working and performing together was an important shared value, and informed the way they worked together

4.3.1.2 A Shared Approach to Working Together

There were three distinct aspects of a shared approach to working together. First, it was essential for all players to agree on a style of working. Examples included whether rehearsals should be democratic, whether to work in short bursts or at length, and how blunt players should be.

In considering her ensemble's shared approach to style of working, one flautist noted that her ensemble in particular preferred to work in short intense bursts:

> I think a lot of is to do, not only with how we play individually, but also

> how we rehearse, and we don't spend, like, we have never regularly rehearsed every week this day, this time. We've never done that. We've always worked really well, sort of intense rehearsing before a specific date. (Flautist, wind quintet)

For this ensemble it was perceived as important that all members were able to work well in this way. In contrast, another ensemble described how their rehearsal ethic was to work for extended periods, spending a long time on each piece:

> And so as a full-time quartet in a sense you're forced into this process of taking it apart and putting it back together again. I suppose on the odd occasion we've done something on virtually no rehearsal but it's very rare, it's not what we're about. In an emergency situation, I think it can still work, because we've got, we're used to having to be flexible but erm, it's a funny process. (Cellist, string quartet)

Despite their different approaches to rehearsing, both ensembles worked effectively and gave accounts of peak performing experiences and co-performer empathy, but the common feature was that all members for each ensemble shared a similar approach to rehearsing. Speaking in general terms about the importance of a shared style of working to the long-term success of an ensemble, the trumpet player explained:

> I like your word empathy. You definitely need to work together. And you can have leaders and you can have democracies I suppose to an extent – whatever works for your particular group, but you just need to ultimately be working together whether that is under the direction of a leader or whether you're just all equal members and all using your eyes and your ears and all empathising. (Trumpet Player, brass quintet)

Another particular point of style of working was honesty. One participant described an ensemble's shared approach to working in terms of a shared attitude towards communication during rehearsals: "we're always really honest, like we'll always say what we think, and we don't have problems saying 'I think you're flat, can we sort it out?'" (Flautist, wind quintet) This kind of honesty was mentioned directly by

three of the groups as an important part of their shared approach to learning.

Second, a shared level of commitment to the ensemble was considered vital. When describing one peak performing experience, one participant explained:

> And it was really good to think that erm, we were all working alongside people were had the same level of commitment to what we were doing and that we'd produced something from it. It was worthwhile. (Oboist, contemporary trio)

A shared commitment to the ensemble is vital, since if players feel that one colleague is contributing less, or not pulling their weight then resentment can build and this can affect the interpersonal relationship between players. It seems likely, therefore, that an equal commitment is required from all players for an ensemble to function at the highest level.

Third, shared goals for the ensemble were essential. The clarinettist of the mixed trio described the importance of shared long-term goals in particular:

> The thing with the college groups is, it's not just always people you fall out with, I think it's people that have got the same, I think it's like a relationship in life, People who have got the same like kind of long-term goals as you. Because I think in first year I was like "right I want to put a wind quintet together that's going to last for like 10 years," and I think a lot of people hadn't thought of that. No. and I think for me that's really what it means more than personality. (Clarinettist, mixed trio)

Here, the emphasis placed on the players having the same long-term goals for the ensemble demonstrates how these affect the approach taken by the members of an ensemble. It might affect the way they approach rehearsals, the kind of gigs they play, whether or not they enter competitions, how often they rehearse, or how much time they dedicate to the ensemble. In order for members to develop a strong empathic relationship and to perform at their best, it is vital that they agree on these kinds of goals. Four of the groups discussed the importance of this kind of shared vision for the ensemble. A shared approach both to musical interpretation and to working together was

found to be a pre-requisite condition for achieving co-performer empathy.

4.3.2 Co-Performer Empathy: Special Connection – 'Clicking' together

The second component of co-performer empathy was special connection. A variety of vocabulary was used to express this idea: "gelling," "exactly synchronised," "an intimate connection," "in harmony," "eyes," "ears," "radar," "instinctively aware," "sympathy," "clicking," "locking in," "getting into each others' heads," "being able to read the other person's mind." No participants used the word "empathy" before being asked direct questions about empathy during the interviews, but all agreed either that empathy was a good description of the same phenomenon, or that they understood the term in the same way.

One of the brass players spoke about an optimal experience of ensemble performance in which his quartet had performed a piece from memory with special choreography. The members of the ensemble performed this particular piece of music whilst standing in a diamond formation and rotating so that the player with the melody stood at the front of the group. He described the special connection he felt to his co-performers during that experience:

> Going back to that "Air from Suite in D" thing that we as an ensemble worked together. We didn't speak. We couldn't see each other. We used our ears, I guess, or there was something else. And I think there was something else. There was a connection that was made between us as an ensemble that made us all move at the same time, all play at the same time. And that's, I don't think that's an education thing. I think that's something else entirely. (Tuba Player, tuba quartet)

A process emerged for forging a special connection between players. It begins with an ensemble formed of players with complementary personalities. All groups spoke of the importance of working with colleagues whom they felt had complementary or similar personalities:

> It's personality as well. When you're stuck in a room together for as many hours as we are in a week, you've got to, you've got to sort of be

> on the same wavelength basically. It would be very difficult with someone you couldn't stand, however good their playing was. Well, I think it's all tied up. I mean, if you love someone's playing it's very unusual that you can't stand them as people. (Second Violinist, string quartet)

It seems likely that having sympathetic personalities within an ensemble is a requirement for achieving co-performer empathy, particularly in terms of forging a special connection between players. When asked what qualities they would look for in an ensemble member all of the ensembles spoke of personality as being an important quality in a colleague. One of the members of the contemporary trio suggested that it was not necessary that all members of an ensemble be good friends, but emphasised that it was essential for all members to get along.

In addition to working with people with similar personalities, most participants described some pivotal social group bonding experiences in the earlier days of working together which they felt were of importance to the ensemble's success. It is likely that these social bonding experiences helped to solidify the socio-emotional connection between players. In his description of an early peak performing experience, one participant explains:

> We were all one hundred percent comfortable with each other and we had that empathy within the group and that was created by the fact that we'd spent the start of the week all the way through. But actually, we didn't just spend that time together in the rehearsal room or on a concert platform or in a school with education work, we spent time together away from that as well, so I think that part of it's really important as well. I think if we all come together and rehearsed for three hours and really went for it and then all went our separate ways, I don't think it would have had the same result as the fact we were all together. (Tuba Player, brass quintet)

It seems likely that spending time together socially, as well as whilst rehearsing and performing together, helps in the development of this special socio-emotional connection between players. However, this kind of social bonding was not mentioned

directly by the string, vocal or mixed ensembles. In the case of the string quartet this could be because they have worked together for 38 years, so they may have completed their "bonding" period a relatively long time ago. In response to a question about their personal career highlights, one of the string players did make reference to many tours, cruises, and group travelling experiences which would suggest that they had had ample opportunity for forming this socio-emotional connection over the years:

> I think, I suppose they tend to be the experiences we've had – often foreign travel has been really interesting. Sort of the lighter things we've done as well – some of the cruises that we've done. We've done up to 20 cruises for P&O. Proper cruises, not just playing in a bar somewhere. That's been nice. But in terms of, that's sort of as a social experience really.... (First Violinist, string quartet)

The vocal duo were a married couple, so for them perhaps this kind of social bonding could be assumed. Similarly, a couple formed part of the mixed trio so perhaps in this case too, social bonding was not mentioned because it was taken for granted.

Following on from this establishment of a socio-emotional connection through complementary personalities and social bonding experiences, the connection was further consolidated through time spent rehearsing together. The development of a connection between players during rehearsals was described as being evident in subsequent performance situations. In the example below a flautist describes how the empathic connection forged between players during the rehearsal process allowed the ensemble to overcome adverse performing circumstances in an audition situation:

> I think it was the connection we all had. It was like we knew exactly what each other were thinking. We knew exactly how to react to each other and purely through all of the hard work, from things like the chamber music competition and the weeks leading up to that audition and that we were in each others' heads nearly. So, even though things were going, were falling apart left, right, and centre it had really, you know, we managed to keep it together. So, I don't think it was the best that we had played, but as a performing experience, I think it was probably one of the most – felt really "in it" I suppose. (Flautist,

contemporary trio)

The idea expressed in the this example of being "in each others' heads" as a result of connecting during rehearsals characterises special connection and was echoed by several of the other groups.

4.3.2.1 Trust and Familiarity: Two Key Concepts Relating to Special Connection

It seems likely that the development of a socio-emotional connection between performers through shared social bonding experiences and the rehearsal process also helped to build a feeling of trust within the whole ensemble, which ultimately contributed to the formation of a special connection during performance and to optimal experiences of performance:

> I think those are the two words: the enjoyment and the trust factor. That you can just trust someone. You almost know "right, this is what's going to happen" and then, from that is when it goes up another notch which is when someone can do something special, because you're not thinking: "OK is this going to work?" – you know it's going to work. It's: "can we make this magical?" (Horn Player, wind quintet)

One of the flautists described the importance of trust between members of an ensemble for positive experiences of performance:

> I think it's such a personal thing to have the confidence and to feel like you're in a safe zone so you can say something that maybe is off the wall or make a, be playing really badly or make terrible mistakes and not feel like people are going to be talking about you. That really requires a certain level of trust. For me anyway to play well, that would be necessary. (Flautist, contemporary trio)

She suggested that in order for a player to perform at his or her best, he or she must feel able to trust the other players in the ensemble. It seems likely that the development of trust is grounded, at least in part, in the process of development of a special connection between players.

A second key concept relating to special connection was familiarity. The soprano of the vocal duo described how rehearsing together over a period of time led to a sort of familiarity with the way other musicians in the ensemble were likely to perform:

> When you do sing with someone quite a bit you, you get an almost uncanny relationship with them in terms of knowing when they're going to breathe. It's particularly knowing, realising they're going to have to breathe somewhere where you hadn't planned to breathe and timing of things. It's quite strange. It's a very odd feeling but certainly is there. (Soprano, vocal duo)

In this case it is evident that these participants had connected so well during the rehearsal process, that they were able to predict instinctively how their co-performers would act or respond in performance. This instinctive familiarity as a result of a connection developed during rehearsals is likely to contribute to peak performing experiences.

4.3.3 Co-Performer Empathy: Intentional Awareness – Perspective-Taking

The third component of co-performer empathy was an intentional awareness of how one's colleagues are operating on either a practical or a musical level. This requires a degree of cognitive perspective-taking in order to understand the difficulties they may face.

4.3.3.1 Intentional Awareness on a Practical Level

An example of intentional practical awareness given by three groups involved gauging other players' moods in order to judge how blunt one could be with criticism during rehearsals:

> I think the only thing is when it comes to rehearsals you have to be more careful, like sometimes you don't say things because you're like "OK I've pushed that person enough today" and for some reason when you get an instrument on your face or under your fingers you, obviously not a violin or cello on your face, the minute that happens it becomes more

> personal because it's your thing. And you know, and when you know someone really well you know how far you can go "come on do it better, come on do it better" and then there comes a point where you have to stop. (Flautist, mixed trio)

Criticism is important for progress, but an awareness of others' states is necessary to avoid insult, maintain a mutual respect, and sustain good working relationships. Another example of practical awareness was given by the tenor of the vocal duo:

> And it must be there with things like string quartets who play together a great deal. I've never felt it quite as much in a bigger ensemble. You had to be more erm, consciously aware of what's going on, rather than instinctively aware. But erm, you have to listen and obviously a lot of things have to be planned. You have to listen, you have to look at people, and you have to understand the physical problems that they may be facing in what they're singing. (Tenor, vocal duo)

This is an example of a very intentional awareness of how other performers are operating, and requires a degree of perspective-taking in order to identify and understand the difficulties they may be facing from their points of view.

A third example of an intentional awareness of how other players are operating on a practical level concerned energy levels:

> I think we know when we're all up and down it's pretty obvious I think, and that's very important especially when you're doing a series of concerts you need to be able to gauge where everyone's at. (Pianist, mixed trio)

This was mentioned by three of the ensembles and was described as being particularly relevant for work whilst on tour together, or whilst delivering workshops.

4.3.3.2 Intentional Awareness on a Musical Level

On a more musical level, players described the importance of an intentional musical awareness of the different expressive ideas and roles embodied by each player at any

point within the music. As one flautist explained, being unaware of other parts and retaining only an individual focus results in "bulldozing through." A sensitivity to the different parts and the ability to shift one's focus away from one's own part seems to be vital in expert ensemble playing. The first violinist of the string quartet described this aspect of intentional awareness of roles in more detail:

> A sort of respect really of each others' roles, and the fact that role does change.... People that don't know what a string quartet does might think that because I'm technically called the leader of the quartet, I decide the way everything goes, and whilst that would be lovely [all laugh] it isn't the case. We all have our roles, and you know there are times when I'm required to play more soloistically and positively, and times when I have to sink back into an accompaniment figure and follow another player's lead. (First Violinist, string quartet)

The understanding of the different parts within the music and the ability to recognise that one's own part is not necessarily the most important part at any one time seems to be vital for being a successful chamber musician. If any of the performers in an ensemble were to play without this intentional awareness of others' parts then the resulting performance would suffer.

Another aspect of intentional awareness on a musical level was making an effort to be aware of how the other musicians in an ensemble were interacting musically. Examples might include the way a phrase is articulated or how loud someone is playing:

> [When] there are two tenors singing in something like the Monteverdi "Vespers," one tenor – and they're echoing each other – one tenor may suddenly decide to do an interesting decoration that's just occurred to him and the other one has to listen to make sure he gets the imitation exactly right. Things of that sort. (Tenor, vocal duo)

This understanding is important for the quality of the music created during performance, because if performers are not aware of co-performers' musical or expressive contributions to the performance, then they are just playing as individuals. The empathic intentional awareness of how others are performing and interacting on a musical level is

essential for a high-quality musical performance, and is, therefore, likely to contribute to an optimal experience of performance.

4.3.4 Spontaneous Interpretative Flexibility: Moments of unplanned ensemble creativity

Spontaneous interpretative flexibility (SIF) was found to be a product of co-performer empathy. This was defined by participants as the spontaneous production of novel expressive variations in performance and was described by all as desirable. The flautist of the mixed trio explained:

> Changing stuff, changing tempos, changing rits, changing dynamics.... That's part of performing. I mean, if it was the same every time it would be really boring. And that's kind of the joy of working with a group for a long time. (Flautist, mixed trio)

All of the ensembles described SIF as something they strived for in performance and it was a feature of almost all of the descriptions of optimal experiences of performance.

According to participants, SIF occurred when they were all acutely aware of their co-performers, and sufficiently connected to be able to respond if a player decided to play something slightly differently in the moment to how it had been rehearsed:

> Last night, for example, when [the flautist] played a particular bit very softly we all had to empathise and play really softly because she made an executive musical decision that she wanted to make it more special. (Bassoonist, wind quintet)

In this particular example, one of the members of the wind quintet had played something spontaneously more quietly during a performance than had been settled upon in rehearsal. The other members of the ensemble were sufficiently connected and aware to be able to react, resulting in SIF.

One of the ways of achieving SIF seems to be through the special connection between co-performers developed during the process of rehearsing together:

> Cellist: but I mean there's still room to be spontaneous and create something
>
> First Violinist: Oh yes
>
> Cellist: but you get that through rehearsal, rather than not rehearsing and being spontaneous. There's a huge difference isn't there
>
> Second Violinist: Yeah, if you haven't rehearsed and you suddenly decide to do something sort of unexpected, it might..

Here, members of the string quartet explain that for them, SIF in performance occurs as a result of the process of rehearsing together, rather than the opposite extreme of not rehearsing at all and just performing a piece. This suggests that the special connection they develop during the course of their rehearsals as well as interpretative decisions they make regarding a specific piece of music both contribute to their ability to produce novel variations in performance. It is likely that trust and familiarity, previously identified as influencing the development of a special connection, both contribute to an ensemble's ability to achieve SIF in performance.

Further evidence of the importance of a special connection for achieving SIF in performance was offered by one of the brass players:

> I think that's one time when we probably actually felt musically, that we were totally free to do what we wanted to do, and everybody else was going to go with wherever the journey took us in that concert just because we'd spent that time together I think. (Tuba Player, brass quintet)

In this example, one of the tuba players describes an optimal experience of performance characterised by a feeling of unity between players and SIF. The participant ascribes the successful achievement of SIF to the strengthened special connection between players during this particular performance, developed through time rehearsing and socialising together.

In addition to special connection, it seems likely that intentional awareness also

contributes to SIF in performance:

> Yes, because if, if in a quartet or a quintet, one person starts to get more animated and excited, and starts to sing louder than you had anticipated from rehearsal, you've either got to somehow, catch the person's eye or indicate to them that you're not going to follow them, or else you follow them. And either, you've got the empathy or they've got the empathy to understand what's going on. It's, it's very, it is very much being acutely aware of everything that's going on around you and relating to it. (Soprano, vocal duo)

In order for an ensemble to successfully achieve SIF during a performance, performers must be actively and intentionally aware of how their co-performers are operating musically.

In discussing the idea of SIF, one ensemble identified what they saw as an extreme flexibility which they perceived as negative:

> I'm saying that if you're going to rehearse stuff that I think that spontaneity should be within smaller margins rather than really big margins because, I mean you've got to be awake and aware and able to adjust, but if you do things radically different, then what was the point in spending hours of your Sunday rehearsing something if you're going to do it differently? You may as well have say with a paper and a coffee and just played it and seen what happens. For me, within chamber music I think that specifically is. (Horn Player, wind quintet)

Here, a horn player suggests that SIF should take place within certain limits. He explains that if players are too extreme in their flexibility then it defeats the purpose of rehearsing the music to agree on a certain interpretation in the first place. This is an interesting point. What should be worked on in rehearsals and how far should the interpretation of a piece of music be agreed upon and fixed by an ensemble in advance of performance? The answer may depend upon the type of ensemble, the genre of music performed, or a particular ensemble's shared approach to performing. Shaffer (1984) found that professional musicians rehearse and consolidate their ideas to such a high

degree that in performance situations, very similar overall timings occur, even when performances are months apart. This suggests that if SIF did occur during these performances, that it either occurred within very similar boundaries each time, or that it occurred within very small margins. In their case study of a new piano duo, Williamon and Davidson (2002) suggested that rehearsals are simply opportunities for musicians to learn the musical score, plan timing and coordination, and establish general expressive features of the music. After this process, spontaneous variations can be aimed for in performance.

Since SIF was a feature of almost all accounts of optimal experiences of ensemble performance in the present study, a more complete understanding of the process and production of SIF in the context of Western Art music. The findings of the present study suggest that SIF is closely linked in some way to the experience of co-performer empathy in performance. Players spoke of both the special connection and intentional awareness components of co-performer empathy as contributing to their experiences of SIF. Further research into the process of SIF and its relationship to co-performer empathy is indicated.

4.3.5 Flow Components

Analysis of the focus group data revealed that, alongside co-performer empathy, certain flow components were key features of expert ensemble musicians' optimal experiences of performance. This is unsurprising since flow is one of the most commonly applied optimal experience frameworks. As outlined in Chapter 1, flow theory indicates nine components for flow which may be present in an individual's flow state:

1. Clear goals
2. Challenge-skill balance
3. Feedback
4. Merging of action and awareness
5. Concentration
6. No worry of failure
7. Self-consciousness disappears
8. Sense of time becomes distorted
9. The activity becomes autotelic

It is not necessary for all nine components to be present in a flow experience (Csikszentmihalyi, 2002), and research has shown that some components may weigh more than others (Jackson & Eklund, 2002). Analysis of the interview data for the present study identified some flow components (challenge-skill balance, concentration, and feedback) within participants' accounts of optimal experiences of performance. In addition, clear goals were identified as part of the "shared approach" component of co-performer empathy. The presence of these components of flow is typical of an account of an optimal experience.

One of the components of flow, concentration, describes a condition in which distractions are excluded from an individual's consciousness. Participants in five out of the six types of ensemble described a similar feeling of absolute concentration in their accounts of optimal experiences of performance: "When you know everyone's really concentrating, really on their playing, and really on the ball it just makes everything, every entry is more confident." Some participants also described the sensation of being completely absorbed in the music: "Erm.. yeah, when we do recitals there are always moments when I think 'yeah this sounds magic' and you're just sort of lost in the moment" (Trumpet Player, brass quintet). These examples suggest the presence of the concentration component of a flow experience and support previous research into individual experiences of flow in music performance (e.g. Wrigley & Emmerson, 2011).

A balance between challenge and skill was also identified. Flow theory suggests that if the level of challenge of an activity is too great then anxiety will be experienced, and if the skill of an individual is too great in relation to an activity, then boredom will be experienced. There were many descriptions of optimal experiences of performance in which challenges were faced and met:

> I think for me it was the LMN audition. Probably. It was one of the.... Just the heat, and again we had done so much work and we were just so in it, and so on it actually really in some ways. But kind of everything went against us and that was a real, I think that was such a sense of achievement after that, because it really felt like not that – but you know things like the heat, and you know the instruments were disastrously out of tune, we had travelled from, all the way to Cardiff, the room was tiny and the panel was massive. There were so many things that really were not conducive, but we really played well that day despite everything else

> and we really came through it – we really pulled it off I think. And that was a real case of "if we can do that and we can impress people, then I think we can do a lot." (Flautist, contemporary trio)

Many of the accounts of optimal experiences of performance made reference to this balance between challenge and skill. There were examples given by every ensemble interviewed. Previous research has shown that this particular component of flow is one of the most important (Wrigley & Emmerson, 2011).

The flow component "feedback" was also identified in the accounts of optimal experiences of performance:

> I think the ones, the high points for me are the points where we've made a connection. Recent rural touring stuff where you're in tiny little church halls but where everyone was sitting at round tables drinking but they were completely transfixed and absolutely loved it and we stayed afterwards and they just wouldn't stop talking to us for about an hour and a half. We couldn't get out the door and- (Flautist, mixed trio)

The feedback component of flow was characterised by any kind of acknowledgement of reaction or response either from an audience or from co-performers. Participants seemed to feel that feedback was important as it could enhance the way they were playing and they were also able, in some cases, to make a connection with the audience. Feedback was present in the accounts given by all ensembles.

Flow theory states that clear goals are important for flow experiences. Shared goals were identified within the shared approach component of co-performer empathy outlined earlier. These were clear, shared long-term goals for an ensemble, as well as shared approaches to the music. This suggests that participants had clear goals as to what their ensemble was aiming to achieve in the long-term, as well as how they aimed to create an interpretation in preparation for performance. Sharing clear goals was another important feature of the accounts of optimal experiences of performance. Whilst research in solo performance has shown that having clear goals is one of the essential components of flow (e.g. Fritz & Avsec, 2007), in ensemble performance it seems that the goals must be shared by the other members of an ensemble, as well as being clear, for an optimal experience of performance.

Finally, all of the ensembles interviewed reported enjoyment. This theme featured heavily in the participants' descriptions of peak performing experiences. Although enjoyment is not one of the components of flow, it has been found that flow experiences result in greater happiness and well-being, and so enjoyment is closely associated with flow experiences (e.g. Csikszentmihalyi, 1997). One of the violinists explained:

> You feel. If you feel that it's gone well you sort of have a nice glow and you think about it after and – I don't know whether you do this – but I might relive the odd little bit and think well, that did go really well. (First Violinist, string quartet)

Here, the first violinist explains that optimal experiences of performance are characterised by what he describes as "a nice glow." The enjoyment is felt as a consequence of the experience rather than necessarily being a part of the experience itself. This is consistent with research on flow which suggests that enjoyment is a product rather than a component of flow. If enjoyment were experienced during a flow state then this would distract the individual from the flow state.

The findings of the present study support those of previous research which indicate that optimal experiences of performance are a type of flow experience (Csikszentmihalyi, 2002). The ninth component of flow in which an activity becomes autotelic is arguably also present in musicians' accounts despite there being no direct references in the data here. Previous research has shown that musical performance activities tend to be strong examples of autotelic activities.

4.3.6 Performance Conditions

In addition to co-performer empathy, SIF, and components of flow, the final contributor to the expert musicians' accounts of optimal experiences of performance was "performance conditions." These were non-psychological factors: repertoire choice and environment.

Repertoire choice was emphasised by all groups to a certain extent. In their many accounts of optimal experiences of performance, all participants made reference to specific pieces:

> Playing *Kabylian*. Erm, I actually can't remember where it was though. But I have such a clear recollection of playing it and it just being absolutely perfect. And not being able to really know why it was perfect, but just being able to feel it, and just riding that wave the whole way to the end. And it just being like a dream, kind of, and that whole soundscape around us, erm, but so it was more of a feeling really for me, than an exact moment in time. That would be the high point I think. Playing wise. (Flautist, contemporary trio)

There were several examples, particularly from the string quartet, brass players, and vocal duo of repertoire choice or the music itself contributing directly to a peak performing experiences:

> I suppose personally one of the highlights of my career was when, before we'd gone full-time singing, that I had the opportunity to sing *Gerontius*. And er, it's really out of my league but it was huge fun, and the most, and one of the most emotional experiences I've ever had. Astonishing piece. (Tenor, vocal duo)

In many cases, participants stated repertoire as being one of the main motivators for playing chamber music.

Environment, the second performance condition, was also identified by all the groups as contributing to their optimal experiences of performing together. The acoustics of a venue were described by the string quartet as affecting how they performed:

> Second Violinist: I think it's sometimes to do with the acoustic as well. I think some acoustics make you play better, and from the minute you start playing you feel 'this sounds right'.
>
> Cellist: You feel supported.
>
> Second Violinist: and then you feel, then you play better than you would

have done if the opposite happens. Some places are a bit of a struggle and then you start to get a bit tense and you erm, and it doesn't go so well.

Cellist: Some places are disastrous.

In addition to acoustics, other aspects of environment were pinpointed by participants. The proximity of the audience to the performers, the prestige of venue, the temperature in the venue, and the type of audience (e.g. VIPs, general public, professional musicians) were all identified by participants as environmental aspects which had influenced performing experiences. These different environmental factors seem to be able to affect the psychological states or perceptions of the performers. It seems likely that certain environmental conditions are more conducive to producing optimal experiences of performance than others.

4.3.7 Optimal Experiences of Ensemble Performance

The results of the analysis revealed that expert musicians' optimal experiences of ensemble performance were a result of co-performer empathy, certain components of flow, and two performance conditions: repertoire choice and environment. Co-performer empathy seems to be the main difference between ensemble and solo optimal experiences of performance. The intentional awareness component and/or special connection component of co-performer empathy were identified in all of the accounts of optimal experiences of performance given by the participants. The shared approach to the music and to working together can be considered to be a pre-requisite for co-performer empathy. The musicians interviewed here emphasised that adopting or developing a shared approach to both aspects was vital to the long-term success of an ensemble, and the quality of their performance experiences together.

In addition, it was found that SIF was a feature of almost all of the accounts of optimal experiences of performance, and that this was closely connected to co-performer empathy in some way. It seems possible that it may arise from a process of co-performer empathy, but further research is required to determine the exact relationship between these two processes.

4.3.7.1 Group Flow

Expert ensemble musicians' optimal experiences of performance have been the main focus of this study. Participants have used various phrases and analogies to describe their experiences, describing moments when everything "just clicks," or when they have felt "in the zone" together as an ensemble. Sawyer (2006) proposed what he terms "group flow" to describe an optimal experience of ensemble performance in any context. Group flow refers to the moment when a group is performing at its peak. It is similar to Csikszentmihalyi's flow, in which an individual is performing at his or her peak. Flow concerns an individual's consciousness, whereas group flow takes into account the experience of an entire group, collectively. Rather than being a psychological state, Sawyer has conceived of group flow as an emergent property of a group.

According to Sawyer, flow is experienced by a group as a result of the performers interacting with one another. It is dependent on interaction and emerges from this process. It is characterised by open communication between performers, with each member of the group being aware of what the others are doing. Sawyer also identifies four components of flow that must be present in experiences of group flow: challenge-skill balance, concentration, feedback, and clear goals. The presence of these four components of flow in the musicians' accounts of optimal experiences of performance in the present study lends further support to Sawyer's model for group flow.

The finding of the present study suggesting that co-performer empathy contributes to ensemble musicians' optimal experiences of performance, may also fit within Sawyer's concept of group flow. Group flow is described as being an emergent property dependent on each member of a group being aware of how the others are operating. This seems similar to the intentional awareness component of co-performer empathy, in which members of the ensemble are alert and intentionally aware of how their colleagues are operating, both musically and practically. The open communicative channel characterising group flow that Sawyer describes may be similar to the special connection component of co-performer empathy. It is possible that an ensemble's ability for achieving group flow may be dependent on the development of a process of co-performer empathy, involving a pre-requisite shared approach to the music and to working together, an intentional awareness of how co-performers are operating, and characterised by a special connection between players.

4.3.8 Differences Between Focus Groups

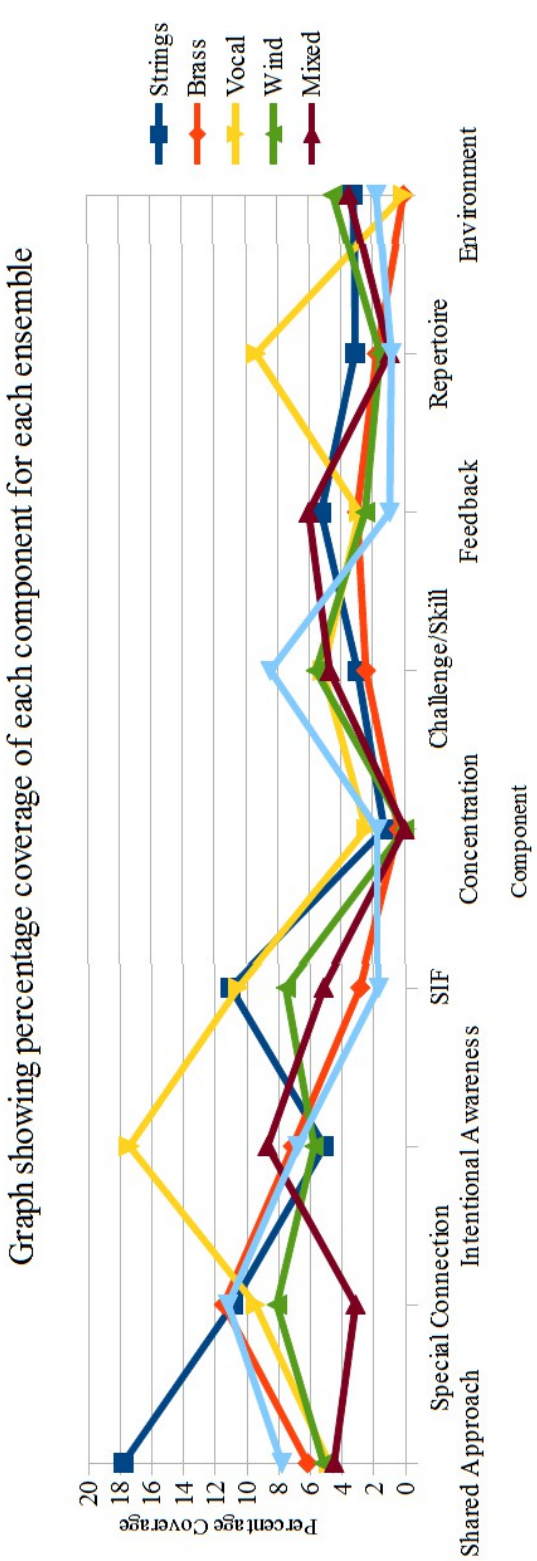

Figure 4.2. Graph showing percentage coverage of each component by ensemble

In general, the percentage coverage scores for each component of the optimal experience model were similar across the data, indicating that the members of different types of ensembles had comparable perceptions and experiences (see Table 4.1.). However, there were some notable points of difference. The vocal duo scored higher than the other ensembles for the intentional awareness component of co-performer empathy and for repertoire choice. The string quartet scored higher than the other ensembles for the shared approach component of co-performer empathy. The mixed trio scored lower than the other ensembles for the special connection component of co-performer empathy. Figure 4.2 shows the percentage coverage of each component for each group.

The vocal duo were much more experienced than the other groups. They had recently retired from life-long performing careers together, whereas the other groups were relatively near the beginning or middle stages of their careers. Looking back and reflecting on their career as ensemble singers may have meant that they took a slightly different perspective to the other groups. It may have allowed them more objectivity perhaps since they were a little further removed from some of the subject matter. It may also have meant that they had had many more of these peak performing experiences than the other ensembles had. They had also been married for many years so their interpersonal dynamic is likely to have been slightly different to that of the other ensembles interviewed and this may also have affected the data from that interview. There may have been certain topics, for example interpersonal dynamics, or social bonding experiences which they did not comment on for that reason.

However, none of these reasons satisfactorily account for the differences in percentage scores for intentional awareness or repertoire choice compared to the other ensembles, so it is possible that these differences are because they were singers rather than instrumentalists. It is possible that singers have a stronger connection to the repertoire than instrumental groups since they often have to embody specific roles or characters. The singers often spoke of strong emotional associations to certain repertoire relating to characters or plots:

> And the, the astonishing way that Britten has two voices in very close harmony as the voice of God. And the moment when that comes back, just as Abraham is about to kill his son is both astonishingly dramatic and amazingly simple in musical terms but, but Britten is clever in these

moments and that certainly is another very, very emotional piece to sing. (Soprano, vocal duo)

This might account for the greater importance the singers ascribed to choice of repertoire in their consideration of optimal experiences of performance.

The vocal duo's score for intentional awareness was also much higher than that of the other ensemble. Singers may be more accustomed than instrumentalists to performing without or away from the music in order to dramatise a character, or to connect to or communicate directly with an audience. This difference in training could, perhaps, account for the singers' higher percentage coverage score for intentional awareness.

The string quartet spoke more about the importance of adopting a shared approach than the other ensembles did. This seemed to concern the importance they felt that the shared approach held when selecting new members of their ensemble. In the 38 years they had been together they had recruited two new viola players, and two new cellists. This could be a result of a difference in experience between the string quartet and the other ensembles interviewed. The only group that had been established for longer than the string quartet was the vocal duo. It could also be a result of the unique nature of the string quartet. There is a long-established, rich repertoire for the string quartet as an ensemble. String quartets are arguably the most well-known type of instrumental chamber ensemble. Since the repertoire is so well-known and since most string players will at some point have played in a string quartet, perhaps the process of finding a new member is slightly different than for a tuba quartet, or a contemporary ensemble, for example. If this is the case, then it is possible that more importance may be placed on certain elements of the selection criteria, and perhaps a shared approach to working and performing is one of the most significant elements of this process. It is possible that the string quartet's higher score for shared approach compared to the other ensembles is a reflection of either greater experience, or difference in ensemble type.

The mixed trio scored lower than the other ensembles for the special connection component of co-performer empathy. It is not clear why this was the case. Perhaps they either did not feel that they had experienced such a special connection during their optimal experiences of performance to the same extent as other ensembles, or perhaps they chose not to dwell on it during the interview. It is possible that the difference was simply due to the social dynamics of that particular ensemble, since two of the three

members were a couple. This could, perhaps, have affected the social processes involved in the group interview and influenced the data gathered. However, the mixed trio's percentage coverage scores for the other components of co-performer empathy were similar to those of the other groups, so this suggests that they had experienced some form of the phenomenon and in a similar way to the other groups.

4.4 CONCLUSION

The first aim of this study was to explore how expert ensemble musicians spoke about optimal experiences of performance and how they viewed co-performer empathy. It was found that these musicians had many different ways of describing their optimal experiences, for example "clicking," and "being in the zone." The second aim of this study was to identify components of co-performer empathy. Participants had different ways of describing co-performer empathy, but three components for co-performer empathy emerged from the data: a pre-requisite shared approach to the music and to working together; a special connection between players during performance; and an intentional awareness of how co-performers are operating both practically and musically. Participants used a variety of vocabulary to describe the special connection component in particular. Examples included "gelling," "exactly synchronised," "an intimate connection," "in harmony," "radar," "instinctively aware," "sympathy," "clicking," "locking in," "getting into each others' heads," and "being able to read the other person's mind."

Addressing the third aim of the study, a model of the relationship between expert ensemble musicians' optimal experiences of performance and co-performer empathy was constructed. It was found that optimal experiences of ensemble performance are a result of co-performer empathy (a shared approach, special connection, and intentional awareness), four flow components (challenge-skill balance, concentration, feedback, and clear goals), and two performance conditions (repertoire choice and environment). SIF was a feature of almost all of the accounts of optimal experiences of performance and was found to be closely connected to co-performer empathy.

Finally, in response to the fourth aim of the study, analysis of the data revealed the percentage coverage of each theme for each focus group and allowed comparisons to be drawn between the ensembles for each component of the model. It was found that the string quartet scored higher than the other ensembles for the shared approach

component of co-performer empathy. This was likely due to difference in ensemble and experience. The vocal duo scored higher than the other ensembles for intentional awareness and repertoire choice. This is probably due to a difference in ensemble behaviour between singers and instrumentalists. The mixed trio scored lower for the special connection component of co-performer empathy than the other ensembles did. This could be due to differences in experiences or in ensemble dynamics.

There were some limitations to this study. No brass ensemble was available to participate in a focus group, so data gathered representing brass ensembles has been taken from three individual professional brass players who have had long-standing careers playing in quartets or quintets. Two of the brass players were members of the same quintet. It is possible that the data gathered from these players may have been different to the data gathered from the other participants, despite the interview schedule remaining the same. Research interviews are social processes and the social interactions within the interview shape the data gathered. However, there was no observable difference in the percentage coverages for the brass players in comparison with the ensembles interviewed. This suggests that it is likely that this had little impact on the data or results. The other main limitation was that the viola player of the string quartet was not able to attend the focus group interview due to illness. This means that the string quartet data was only gathered from three out of the four members. This could also have affected the results. However, aside from a higher score for one of the sub-themes, described above, there was no notable difference between the results for the string quartet and those of other ensembles. The contemporary ensemble interviewed were two of the three members of the author's own ensemble, on whom the interview schedule was piloted. Again, there was no discernible difference in the results for this ensemble in comparison with the others.

The present study has examined co-performer empathy in the context of expert ensemble musicians' optimal performance experiences. From the data it has been possible to construct a model representing the components that contribute to co-performer empathy. However, co-performer empathy during ensemble playing is a constant, complex process and it is beyond the scope of this focus group study to develop a model of that process. However, analysis of the data gathered here suggests that co-performer empathy during ensemble playing is a constant, complex process and the focus group data provide only a preliminary perspective into this process. For now, it is possible to assert that co-performer empathy is an essential feature for expert

ensemble musicians' optimal performance experiences. It is based upon a pre-requisite condition of a shared approach to musical interpretation and to working together. It is, at least sometimes, characterized by a special connection between players, and is likely to involve a degree of cognitive perspective-taking, through an intentional awareness of one's colleagues on a musical and a practical level. However, the next step of this thesis was to determine further the process of co-performer empathy in expert ensemble playing. It was clear from the results of this focus group study that co-performer empathy and SIF are both relevant to expert ensemble musicians' optimal experiences of performance, and so the ensuing study researched both phenomena in order to reveal the potential relationship between the two.

CHAPTER 5. STUDY 2: OBSERVATIONAL CASE STUDY WITH A STRING QUARTET

5.1 INTRODUCTION

"Expert performance is often characterised by the fresh reconstruction of performance parameters... on every occasion" (Sloboda, 1985, p. 97). Music is a complex-patterned material offering a lot of scope for variability in performance. Variability of musical interpretation in expert performance arises in the moment rather than being pre-planned, and can, therefore, be characterised as "spontaneous." An expert performer can approach a performance with a degree of what Sloboda terms "optionality." That is, he or she can choose spontaneously during a performance whether to reproduce a previous interpretation, or whether to produce an interpretation that is wholly or partially different in expression. This can be achieved through the spontaneous variation of a number of performance parameters, including (but not limited to) dynamics, tempo, articulation, fingering, timbre or intonation. In solo performance, spontaneous interpretative flexibility (SIF) is a relatively simple process involving the soloist spontaneously deviating from an established, practised interpretation and producing some form of novel variation. However, in the context of ensemble playing, the phenomenon becomes more complex by virtue of its becoming a group process involving inter-individual co-variation (Keller, in press). SIF in ensemble playing is defined here as the spontaneous production of novel variations differing from an established interpretation, produced by an ensemble whilst playing together.

Ensemble performers have described SIF as the ability to identify and respond immediately to a co-performer interpreting the music differently in the moment to the way it had been established in rehearsal (Davidson, 1997). It is this capacity to identify and respond in the moment to one's colleagues that determines the degree of success of SIF in ensemble playing. Intuitively, this capacity appears to be directly linked to the intentional awareness and special connection components of co-performer empathy. Moreover, the focus group analysis from the previous study indicated that SIF was closely connected to, possibly even a product of, co-performer empathy. Figure 5.1 extracts the components of co-performer empathy from the model generated in the focus group study which found that co-performer empathy involved a pre-requisite shared

approach to the music and to working together, an intentional awareness of how co-performers are operating (on both musical and practical levels), and was characterised by a special connection between co-performers.

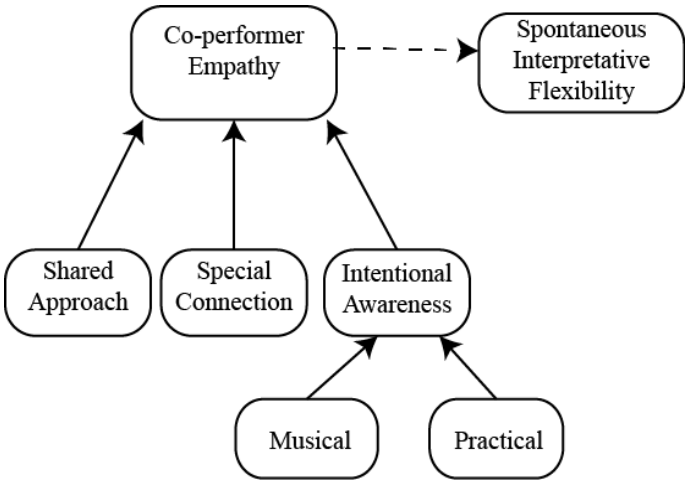

Figure 5.1. Components of co-performer empathy model

All of the expert ensemble players interviewed as part of the focus group study spoke of SIF as an important and desirable aspect of their optimal experiences of performance. They explained that they strived for SIF in performance. These views support evidence from previous research on the production of novel variations in ensemble performance. In his book of interviews with the Guarneri Quartet, Blum (1986) explored this phenomenon. The players described a sense of spontaneity and a degree of improvisation in their performances as being of crucial importance. Michael Tree described the quartet's approach to performing in terms of flexibility (p. 20):

> The playing of quartet music is.... an organic process. Each of us is influenced by constantly fluctuating circumstances. Each 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.

Here, the importance of constantly identifying and responding to changes in the music for SIF to occur is highlighted once more. The players go on to state explicitly that “the

whole business is reactive; that's the key to spontaneity." In a later study, Davidson (1997) also found evidence that the production of novel variations was dependent upon a performer's ability to discern and react immediately to their co-performer's musical ideas during performance. Keller (2008) proposed three cognitive-motor skills which interact to allow a performer to anticipate, attend, and adapt to auditory or visual cues generated by co-performers during a performance.

From the existing literature, it seems likely that an ensemble's capacity for SIF may be informed directly by ensemble musicians' abilities to identify and respond to variability in their colleagues' playing. It is also possible that this same capacity for SIF is also informed by the level of the musicians' technical and musical abilities. Ensembles whose members have lower levels of expertise may have to concentrate more on basic technical and ensemble skills (Davidson & Good, 2002), limiting the potential production of SIF. It is probable, therefore, that SIF is more likely to be achieved successfully in expert, established ensembles than it is in less proficient, less experienced groups. Further evidence in support of this theory exists in a related field, where research on socio-emotional behaviour in group work suggests that a similar kind of flexibility is the product of a well-functioning, established group (West & Anderson, 1996).

Since the results of the focus group analysis in the previous study revealed that expert ensemble players viewed SIF to be a possible product of co-performer empathy, and since existing research in ensemble playing suggests that an ensemble's capacity for achieving SIF is likely to be dependent upon the players' ability to identify and respond, it is very probable that SIF is firmly grounded in the phenomenon of co-performer empathy. If this is indeed the case, then expert ensembles' use of SIF in performance merits further study within this thesis in order to more fully explore this connection. If SIF is a product of co-performer empathy, then by identifying moments of SIF in an ensemble's performance it may be possible to identify with a degree of certainty moments when players are experiencing an empathic connection, whether intentional or instinctive. This is not to say that when players are not producing spontaneous novel variations they are not empathically connected in some way; rather that when the variations occur it is probable that there is an empathic connection.

This observational study, therefore, had four aims:

1. To find further evidence in support of the components for co-performer empathy

identified in the focus group study (intentional awareness and special connection).

2. To construct a model of the process of SIF in expert ensemble performance.
3. To construct a model of the process of co-performer empathy in expert ensemble performance.
4. To determine the relationship between SIF and co-performer empathy in expert ensemble performance.

There were two research questions related to these aims. Do expert ensemble musicians perceive there to be a connection between experiencing co-performer empathy and achieving SIF during a performance? Do expert ensemble musicians experience SIF at the same moment?

5.2 PILOT STUDY

A pilot study was conducted in the first instance to test the design of the study, and application of the video recall method in particular.

5.2.1 Pilot Study: Method

5.2.1.1 Participants

The participants for the pilot study were the members of an expert, award-winning piano-percussion quartet who had been working together for over a year (male, 2; female, 2; $M = 24.5$).

5.2.1.2 Materials

A *Sony Handycam* camcorder, and tripod were used to record the ensemble's rehearsals and a live recital performance. *MPEG Streamclip* video editing software was used to cut the recorded data into excerpts. Participants were issued DVD copies of video excerpts and video recall log sheets to carry out their video-recall coding.

5.2.1.3 Procedure

A rehearsal, dress rehearsal, and evening recital performance of the same piece of music (*Pulse Magnet* – Matthew Hindson, 2001) were video-recorded with the researcher

remaining in the rehearsal room with the quartet during the recording. All recorded data was transferred to computer. Since the rehearsals included work on other pieces, all video data relating to *Pulse Magnet* was identified and selected. This resulted in four excerpts – two from the rehearsal (total, 57 minutes), one from the dress rehearsal (14 minutes), and one from the performance (14 minutes).

Using a code-specific video recall method (Welsh & Dickson, 2005), two of the four participants (a male pianist and a female percussionist) were given a project pack containing an instruction sheet, DVD with all four excerpts, and a log sheet to be completed (see Appendix III). They were asked to view the excerpts and identify moments exemplifying:

1. Special connection: moments when the participant felt a special connection to any of the other performers.
2. Musical aspect of intentional awareness (musical IA): moments when the participant was aware of how their co-performers were operating on a musical level.
3. Practical aspect of intentional awareness (practical IA): moments when the participant was aware of how their co-performers were operating on a practical level
4. SIF: moments when the participant felt he or she was being spontaneously flexible or creative in their approach, playing, or interpretation.

Following completion of the logs, both participants were interviewed individually and asked to identify a moment exemplifying each coded component to describe in more detail with reference to the video data, as well as being asked a series of unstructured interview questions relating to the coding process. Participants were asked about SIF in particular and its relation to the components of co-performer empathy in their experiences of the coding process.

5.2.1.4 Analysis

The participants' recall logs were read, re-read, explored, and compared. Any similarities and differences between participants relating to the coding of each component of co-performer empathy as well as SIF were noted, as well as any overlap between components. A thematic analysis was conducted on the interview transcripts to

identify any common themes or ideas that were expressed in relation to each moment. The recall logs and interview transcripts were then examined side by side and with reference to the study's aims and research questions.

5.2.2 Pilot Study: Results and Discussion

Table 5.1 below shows the number of times each of the four codes was logged by each player. Participants gave time stamps as an indication of moments. Any longer moments were indicated by specific durations. Moments were assumed to last no longer than 5 seconds unless otherwise indicated.

Table 5.1. Frequency of coding for each component by each player for each excerpt

	Musical IA	**Practical IA**	**Special Connection**	**SIF**
Excerpt 1: Rehearsal (00:35:20)				
Pianist	3	2	0	1
Percussionist	23	12	3	1
Excerpt 2: Rehearsal (00:21:52)				
Pianist	5	1	0	0
Percussionist	6	9	3	4
Excerpt 3: Dress rehearsal run-through (00:13:33)				
Pianist	3	4	1	3
Percussionist	5	6	4	7
Excerpt 4: Performance (00:14:00)				
Pianist	1	3	2	2
Percussionist	6	8	5	8

The percussionist coded more instances of every component than the pianist did. The difference in the frequency of coding between the two players indicates that they may have understood either the definitions for each component, or the task differently. There was only one example of an instance of any of the components being coded at the same time by both participants. This was the a moment of perceived special connection during the performance excerpt (at time stamp 00:12:07) at the piece's climax.

5.2.2.1 Intentional Awareness

The most striking difference in coding frequency between the two players is the number

of moments of perceived musical IA coded in excerpt 1. The percussionist coded 20 more moments of this code than the pianist. The practical IA code was particularly prevalent in the percussionist's log. She explained that the set-up for the piece was very complicated and the percussionists were often running from one instrument to the next, so the all performers had to be very aware of moments where extra cues or time might be necessary. She felt this fell into practical rather than musical intentional awareness, since these were extra-musical issues. However, both players coded examples of both musical and practical aspects of the intentional awareness component of co-performer empathy.

5.2.2.2 Special Connection and SIF

As Table 5.1 shows, moments of special connection and SIF were coded by both participants, but the number of moments coded across the rehearsals and performance differed between players for both codes. The percussionist thought that special connection and SIF were more prevalent in the performance, whereas the pianist found no difference in frequency between the performance and rehearsals. Speaking about the two themes, the pianist explained that due to the restrictive nature of the repertoire, there was not much scope for SIF. He stated that the whole point of the piece was that there was a constant, unrelenting beat the whole way through, with no space for rubato. He related this to the idea of a special connection between players by explaining that for this kind of repertoire "by definition it's clicking if it's together." He stated that so long as the ensemble was strong and all parts locked together then there was a sense of special connection between the players. When the ensemble was not so neat and there were tempo variations, then he did not feel a special connection to the others.

The percussionist agreed that special connection was most present when all four parts locked together. When describing a coded moment of special connection she added that she perceived the quartet to be experiencing a special connection when their body gestures aligned. She identified several moments during the performance where the quartet musicians could be seen to be visibly pulsing or "grooving" along to the music. She explained that she perceived this group bodily gesture to be an indicator of the ensemble being "in the zone together." She commented that greater concentration from all players in the performance explained the greater prevalence of special connection and SIF in the performance clip. Her recall log data supports this assertion, showing five instances of perceived SC during the performance excerpt, compared to

four, during the dress rehearsal. The pianist's recall log showed two instances of special connection during the performance clip, compared to one during the dress rehearsal.

There were four examples of two different components being coded for the same moment in the percussionist's recall log. Two examples of special connection being coded at the same time as SIF (Excerpt 1 – 00:34:43; Excerpt 3 – 00:08:28), one example of musical IA and SIF (Excerpt 2 – 00:17:55), and one example of practical IA and SIF (Excerpt 3 – 00:09:30). Interestingly, there were no examples in the performance excerpt. There were no instances of two components being coded simultaneously in the pianist's recall log.

5.2.2.3 Evidence for the Components of Co-Performer Empathy

In terms of study's first aim (to find further evidence in support of the components of co-performer empathy), no definite conclusions could be drawn from this pilot study. Both participants logged examples of each of the codes relating to the components of co-performer empathy, suggesting that they recognised these components in the video excerpts. However, the participants' disagreement on the definitions of the codes suggested by their different recall logs did not offer strong or conclusive evidence for any component. An example of the different ways the two players coded is given in Table 5.2, which shows the coding from the participants' recall logs of the performance excerpt. There was only one moment (indicated in bold) that had been coded in the same way by both participants, and the pianist logged fewer instances of all codes than the percussionist did.

Table 5.2. Participants' logging of all codes during the performance excerpt

Component	**Pianist**	**Percussionist**
Musical IA	02:05 – A lot of confidence in section	00:20 – T leads ensemble
		01:34 – communicate for "big hit"
		01:34 – P conducts
		04:30 – P cues new section
		06:17 – T glance for entry
		10:18 – P leading
Practical IA	05:30 – Overlapping of piano voicing	00:54 – P nods to solidify tempo
	10:34 – Tempo kept solid	02:32 – T looks at P for tempo change
	13:47 – Fleeing convincing	06:42 – Adjusting to tempo issues
		09:58 – Creating an effective silence

		11:05 – T looks at me for my solo
		11:19 – Handing over to T
		11:31 – Handing over to T
		12:53 – T looks to P
Special Connection	03:25 – Mutual respect for silence	02:04 – T grooves, in the zone
	12:07 – a lot of fun with this climax	02:17 – Whole ensemble in zone
		02:44 – Whole ensemble jamming
		08:22 – Ensemble in the zone
		12:10 – Ensemble in the zone
SIF	07:53 – tempo kept fast	03:07 – SIF with tempo
	11:15 – Improv used different drums	03:44 – SIF with dynamics in percussion
		05:22 – SIF
		05:35 – SIF between two pianists
		05:58 – T flexible in cymbal solo
		08:10 – Pianists flexible in “trade-offs”
		08:54 – H adjusts to my rubato
		13:30 – SIF when H changes her rubato

5.2.4.4 The Process of SIF and the its Relationship to Co-Performer Empathy

It was also impossible to meet the second and third aims of the study concerning the processes involved in SIF and the relationship between SIF and co-performer empathy, because there was insufficient or contradictory evidence. The percussionist in her interview said that she felt that moments of SIF in the performance were a product of a combination of an intentional awareness (both musical and practical aspects), and some form of instinctive response as a result of a special connection between players. However, the pianist disagreed, saying that idea of SIF was not applicable to the ensemble’s performance. He felt that for this particular ensemble, SIF was only possible for the solo portions of this piece. Since only two of the four participants were available to take part in the video recall, the results did not produce any clear findings. The two recall logs were completely different, as were the two participants’ views of co-performer empathy and SIF during the recall interviews.

The nature of this particular ensemble’s set-up of two grand pianos and two percussion sets meant that most of the musicians’ experiences were heavily influenced by logistical concerns, and this was reflected in their recall logs and interviews for this pilot study. The players explained that each rehearsal was set up in a different rehearsal room, in a different layout, and often on different instruments. It was not until the dress rehearsal, on the afternoon of the recital, that they were able to rehearse in the concert

space on the instruments and in the layout for the concert. For instance, the dress rehearsal was the first time the group had played the piece on grand pianos rather than upright pianos. Another consequence of these difficulties and the nature of the instrumentation for this work was that the ensemble members were often unable to hear one another whilst playing.

In addition to these unique logistical issues, Hindson's *Pulse Magnet,* a contemporary work, is very rhythmically driven and the common thread throughout the piece is the constant, driving pulse. For this reason, the parameters for rubato and SIF were extremely rigid. In their interviews both players made reference to the nature of the music being non-conducive to SIF. Both agreed that the ensemble's main focus was on maintaining the tempo and pulse, staying together even when they often couldn't hear other parts, and trusting their co-performers. The pianist went so far as to say that tempo flexibility was undesirable in this piece, and was something the players aimed to avoid. For these reasons, the coded moments took on slightly different definitions for this particular group, since the music, the combination of instruments, the repertoire, and the logistical issues surrounding performance were so unique to this ensemble.

5.2.3 Pilot Study: Conclusions

Although the players' logged moments for each of the codes did not correspond, the video-recall method of logging these four codes was successful. It was possible for performers to identify instances of intentional awareness (both musical and practical aspects), special connection, and SIF. With regard to the first aim of the study, this suggested that there was further evidence in support of these two components of co-performer empathy as well as SIF. However, the study's second, third and fourth aims (to determine the process of SIF and co-performer empathy, and their relationship to one another), were not successfully addressed here. This was mainly because the participants' recall logs and opinions on the nature of SIF for their ensemble and this particular piece, were different. In terms of the study's two research questions, there was no concrete finding on whether there was a connection between experiencing co-performer empathy and achieving SIF. As a result, it was impossible to determine how these two processes might be related. There were no examples of SIF being coded at the same moment by both players. Again, this is most likely due to the rigid nature of this particular piece of music.

There were several limitations to this study. Most limitations related to the unusual nature of the ensemble and repertoire involved. Following the pilot study it was decided that it would be better to use a more conventional instrumental ensemble, playing more conventional repertoire for the main study, to increase the chances of identifying moments of SIF and co-performer empathy. It was also determined that it would be better for the researcher not to be present in the rehearsal room during recording to minimise the observer effect on the observational data gathered. The unstructured interview questions from this pilot study were reviewed and used to develop a series of semi-structured interview questions for the main study (see Appendix II). Finally, it was determined that all members of an ensemble would be required for the main study to obtain more complete results. It was also decided that the instructions for the completion of the code-specific recall logs would be given to all the participants in greater detail, to avoid any confusion or disagreement between participants on how the logs should be completed.

5.3 MAIN STUDY: METHOD

5.3.1 Participants

The participants for the main study were the members of an expert, established string quartet who had been playing together for over three years, had won several prestigious prizes, and held a fellowship at the European Chamber Music Academy (female, 4; M = 23 years).

5.3.2 Materials

A *Sony Handycam* camcorder, and tripod were used to record the ensemble's rehearsals and performance. *MPEG Streamclip* video editing software was used to cut the recorded data into excerpts. Participants were issued DVD copies of video excerpts and video recall log sheets to carry out their video-recall coding.

5.3.3 Procedure

A rehearsal and a performance of Schubert's *Quartettsatz* were video-recorded within

the space of a week. Unlike the pilot study, no external observer was present during the rehearsal recordings. Video footage of the rehearsals (1.5 hours) and the recital performance of the same piece (9 minutes) were burned to DVD and given to the quartet members along with an instruction pack and a video recall log sheet. The code-specific video recall method was used in which participants were asked to identify and comment on four different kinds of moment in the video recordings. Three moments related to components of co-performer empathy identified in the focus group study (two aspects of intentional awareness (musical and practical), and special connection); the fourth was SIF. The researcher then met with each participant individually to discuss their responses, to describe in more detail the moments they had identified for each code, and to explain how they thought the codes fit and related within the workings of their ensemble. These meetings were audio-recorded and then transcribed.

5.3.4 Data Analysis

The participants' recall logs were read, re-read, explored, and compared. Any similarities and differences between participants relating to the coding of each component were noted, as well as any overlap between components. A thematic analysis was then conducted on the interview transcripts to identify any common themes or ideas. The recall logs and interview transcripts were then examined side by side, and considered in relation to the study's aims and research questions.

5.4 RESULTS AND DISCUSSION

The results of the analysis will be presented and discussed here in three parts: first, the coding of the components of co-performer empathy and SIF; second, the process of SIF; third, the process of co-performer empathy and its relationship to SIF.

5.4.1 Coding Components of Co-Performer Empathy and SIF

Analysis of the participants' recall logs and interview transcripts found further evidence that co-performer empathy consisted of an intentional awareness and a special connection. It was found that the musical aspect of intentional awareness was more important than the practical aspect of intentional awareness, since this was coded less

often and less consistently.

5.4.1.1 Intentional Awareness: Musical Aspect (Musical IA)

There were many examples of musical IA identified by all four players in the recall logs. Table 5.3 shows the number of instances of perceived musical intentional awareness coded by each player (V1 = violin 1, V2 = violin 2, VA = viola, VC = cello). The timings of each excerpt are given in minutes.

Table 5.3. Frequency of musical IA coded by each player

Player	**Rehearsal (01:31:03)**	**Performance (00:09:03)**
V1	7	4
V2	6	1
VA	19	3
VC	16	3

Participants generally agreed over the kind of moments that were coded as musical IA. Examples of ensemble, balance, following leads, awareness of dynamics, intonation, being in each others' sound, and awareness of the harmony were coded. The violist commented that the ensemble's intentional musical awareness of intonation was the most striking for her throughout the rehearsals.

> We did a lot of work on things like intonation, and just really having to listen and like be in each other's sound, so I think that was the main thing that came across through most of it for me. (Violist)

Moments of musical IA picked out during the interviews included examples of both verbal and non-verbal communication. The first violinist was particularly struck by the ensemble's use of gesture in relation to musical IA.

> The thing that most struck me was how much movement makes such a difference especially in a quartet, because the moments where we'd speak about it "let's do this here," and the difference in movement between the time before and the time afterwards was everyone would do something different movement-wise, and everyone would move

> together, and would then do the same thing. It sounds simple you know, but actually, if you think about it physically it's not at all. It's quite amazing that... just kind of feeling it in the same way would make people play it a different way. (First Violinist)

Viewing the video data, she noticed that when all members had a greater musical intentional awareness of the actions of their colleagues at a particular point in the music, that the players would all use similar gestures.

Interestingly the musical IA code was sometimes coupled with the special connection code both in participants' logs (nine times altogether, by all four participants) and during the interviews, although none of the participants appeared to have difficulty separating the two codes conceptually. The cellist gave an example of the ensemble's attention to intonation as an instance of both musical IA and special connection.

> Right at the start of the first bit, when we were doing scales and stuff to warm up.… we'd play something and then all kind of know which note to stop on because it was out of tune. You know, sometimes we'd say "stop" but sometimes we'd just all stop because we knew it was out of tune and we'd just wait until it was in tune and then carry on. So I guess that was.. kind of just following each other in an other dimensional kind of way. (Cellist)

In this example she coded both musical IA and special connection, because she felt the players were aware of how their colleagues were operating on a musical level and that there was a special connection between players characterised by their non-verbal agreement of when to change notes. The first violinist agreed, commenting that "there were a lot of.... places where we were operating on a musical level, and I felt a connection because obviously those are intertwined."

There were many incidences of musical IA coded by all players in both rehearsals and the performance. This provided further evidence in support of musical IA as an essential component of co-performer empathy and its inclusion in a model of co-performer empathy in ensemble playing.

5.4.1.2 Intentional Awareness: Practical Aspect (Practical IA)

There were fewer examples of moments of practical IA than musical IA logged by participants, and, in contrast to the percussion-piano quartet participants, none of the string quartet players logged any instances of practical IA during the performance. This is likely a reflection of the different nature of the two ensembles, with the percussion-piano quartet being very concerned with practical and logistical issues at all times. Table 5.4 shows number of instances of perceived practical IA coded by each of the string quartet musicians.

Table 5.4. Frequency of coding of practical IA by each participant

Player	**Rehearsal (01:31:03)**	**Performance (00:09:03)**
V1	4	0
V2	6	0
VA	7	0
VC	2	0

Examples tended to concern the ensemble's awareness of technical challenges that were often instrument-specific. For instance, the first violinist identified and described a moment of practical awareness in which the ensemble discussed how best to manage a particular moment of the piece taking the technical difficulties as well as the musical interpretation into consideration.

> Practical things like this one where we're talking about string crossings and there was a problem because they were big string crossings for [the second violinist] and [violist] and that was just a physical problem. If they didn't have that problem then we wouldn't necessarily worry about that moment and we wouldn't take time which is what we ended up doing. But that's what we did to solve the problem, because if you do it too quickly then it sounds too panicked and we wanted to give it space and time. (First Violinist)

The first violinist explained that the decision they made was largely based on a practical IA of the physical problems faced by two of their colleagues, but was also informed by

a musical IA of the phrasing at that particular moment, so she had coded this moment as both practical and musical IA. Practical IA was often coded alongside musical IA (seven times altogether by three of the four participants).

The practical IA code was often miscoded to include examples of any kind of technical concern in the music rather than recognising and responding to the physical problems of colleagues. Players included examples of general difficulties with intonation, balance, and instrument-specific challenges in general. There were relatively few examples given of moments of practical IA according to the definition intended. It is likely that this is due to the players misinterpreting the description of practical IA in the coding scheme because either it was unclear, or there were so few examples of those moments that they took it to mean something broader. The players' understanding of the definition for practical IA code did not match the definition from the focus group study. Their definition was not relevant to co-performer empathy because it was often an individual focus on one's own technical concerns, or a general awareness of technical concerns during the rehearsal, rather than recognising and responding to those of their colleagues.

The misinterpretation of this code by all participants suggested that the practical aspect of the intentional awareness component of co-performer empathy should be considered less important than the musical aspect. As the first violinist suggested above, the ensemble prioritised musical interpretation above all else, so a practical IA of the way colleagues were operating or the physical challenges they faced was important only in so far as it affected the interpretation of the music. That practical IA was often coded alongside musical IA, and that the players often misinterpreted the theme suggests that a practical IA is, perhaps, not a strong enough component of co-performer empathy to merit its separate inclusion in the model. However, it is clear from the results of the analysis that the intentional awareness component of co-performer empathy was recognised by all of the participants, despite the musical aspect of it being stronger than the practical aspect, and seems to be an essential component of co-performer empathy.

5.4.1.3 Special Connection

Instances of perceived SC were coded by all players. Table 5.5 shows the number of moments of perceived special connection coded by each participant.

Table 5.5. Frequency of coding of special connection by each participant

Player	**Rehearsal (01:31:03)**	**Performance (00:09:03)**
V1	4	4
V2	4	3
VA	6	1
VC	3	1

It was generally agreed during the recall interviews that a special connection between players was more obvious in the performance video. This is reflected in the recall log data shown in Table 5.5, particularly in the coding by the two violinists given that the performance was a fraction the length of the rehearsal footage. However, participants did code several instances of special connection during rehearsals. Moments included non-verbal examples in particular. All participants described an unspoken understanding that they attributed to a special connection between them. One example given by the cellist and violist in their recall logs was of the scales they played at the start of the rehearsal and how they knew instinctively when to move to the next note together as though they felt it, rather than following an explicit lead or verbal command.

Interestingly the cellist also coded the beginning of the performance as a moment of special connection. During the interview she explained that watching the video, all four players can be seen to be settling down and getting comfortable, getting in the zone ready to begin the performance:

> The first one was where we all sat down. That was really interesting watching because normally, when you first sit down on the concert stage all I'm thinking about is “am I comfortable, is my spike the right length” but actually to watch all of us do it, because I've never just sat down and watched what we do but we all have our own little rituals of getting comfy and shuffling and moving the stand and that was really interesting. And I think that was definitely everyone just [exhales] kind of getting ready, in the zone. (Cellist)

It is possible that the special connection between players might be established in this

way from the very beginning of a performance as part of a "getting ready ritual" as all players take a moment to settle in and focus on the task at hand.

All participants picked out moments of special connection during the performance and these moments were more prevalent in the performance log than they had been in the rehearsal logs. When asked how they judged from watching the video whether they were experiencing a special connection, one player explained that it was when all players were really together in terms of ensemble and were able to anticipate and then react to something slightly different that happened. This suggested the existence of some kind of link between special connection and SIF in performance, although the logs did not always reflect this by showing special connection and SIF coded at the same time. It is possible that some instances of SIF in ensemble performance are characterised by a special connection between players.

5.4.1.4 The Components of Co-Performer Empathy

There were a few examples of two components being coded simultaneously by the same player to describe the same moment of video. Table 5.6 shows the number of times a component of co-performer empathy was coded alongside a different component of co-performer empathy by the same performer.

Table 5.6. Frequency of coding of two different components of co-performer empathy by the same player at the same time

Codes	**Rehearsal (01:31:03)**	**Performance (00:09:03)**
Musical IA with Practical IA	7	0
Musical IA with Special Connection	7	2
Practical IA with Special Connection	1	0

There also were a few examples of a moment of video being coded as an example of one of the components by more than one player at the same time. Table 5.7 shows the number of times an instance of each component was coded by two players.

Table 5.7. Frequency of coding of same instance by two participants

Code	**Rehearsal (01:31:03)**	**Performance (00:09:03)**
Musical IA	5	1
Practical IA	1	0
Special Connection	1	0

Moments of musical IA coded by more than one player during the rehearsal included examples concerning dynamics, keeping tempo, intonation, balance, ensemble, and sound. There was one example of musical IA being coded by three of the four performers at the same time (at 00:13:00 in the rehearsal data). The one example of practical IA being coded at the same instance by more than one player was described differently by both players. One player described it as an example of practical IA concerning an awareness of ensemble logistics; the other player referred to an awareness of the energy level of one of her colleagues. This suggests that, although both players coded the same moment as practical IA, this does not necessarily signify a moment of stronger practical IA. It also adds further weight to the conclusion that the practical IA component was interpreted differently by each participant. The example of special connection coded by two players at the same instance was an example of a collective, unspoken decision concerning intonation during the rehearsal.

In response to the first aim of this study – to find further evidence in support of the components of co-performer empathy identified in the previous study – analysis of the recall logs and interviews provides further evidence that intentional awareness and special connection are essential components of co-performer empathy. The practical aspect of intentional awareness (practical IA) was found to be less important and less consistently coded than the musical aspect (musical IA) in the present study. In the pilot study, the percussionist and pianist coded several instances of practical IA during both rehearsals and performance. However, the unique nature of that particular ensemble with their complicated instrumental set up, as well as the technical nature of the music they were playing, likely contributed to the higher number of instances of practical IA coded. The string quartet in the present study were a more conventional classical ensemble, playing a piece of romantic string quartet repertoire. They did not have any particular practical concerns (extra equipment, multiple instruments, electronics, and so on). The findings of the present study seem to indicate that intentional awareness is an

essential component of co-performer empathy, but that the musical aspect of intentional awareness is more important than the practical aspect.

The focus group study found that a shared approach was a pre-requisite for co-performer empathy. That is, that expert ensemble players had to have a common approach both to the music and to working together, in order to achieve co-performer empathy. The shared approach component of co-performer empathy was not directly investigated in the present study. However, during their interviews, participants did mention the importance of all members sharing a shared approach to interpretation. The second violinist expressed this, saying: “it's just about trying to be one mind. So all understanding the music and then all coming together, so it's like you're trying to be one person and reacting to it as one.” Previous research has also shown that a shared performance goal is vital for collaborative performance (Keller, 2008; Williamon & Davidson, 2002) and that the interpersonal alignment of fundamental and expressive parameters fosters ensemble cohesion (Keller, in press). This shared approach, or common vision, with regard to musical interpretation is essential for expert ensemble performance and should be considered an essential pre-requisite for the occurrence of SIF. If this is the case, then it seems likely that the process of co-performer empathy in ensemble playing is based on a pre-requisite of a shared approach and involves an intentional awareness, and a special connection between players.

5.4.1.5 Spontaneous Interpretative Flexibility

Instances of perceived SIF were coded by all participants in the recall logs. Table 5.8 below shows the frequency SIF was coded by each participant.

Table 5.8. Frequency of coding of SIF by each participant

Player	**Rehearsal (01:31:03)**	**Performance (00:09:03)**
V1	0	5
V2	1	1
VA	1	2
VC	2	6

According to the recall log results, all participants identified more instances of perceived SIF during the performance than during either of the rehearsals. This supports evidence from the focus group study where participants suggested that SIF was a central

feature of peak performance experiences. During their recall interviews, the players each stated that SIF was something that they as an ensemble strived for in performance. This supports the findings of previous studies (e.g. Blum, 1986).

There were examples of SIF being coded alongside components of co-performer empathy during both the rehearsals and the performance. Table 5.9 shows the number of times SIF was coded alongside each of the components of co-performer empathy in the recall logs.

Table 5.9. Frequency SIF was coded alongside each component of co-performer empathy

Codes	**Rehearsal (01:33:03)**	**Performance (00:09:03)**
SIF with Musical IA	3	7
SIF with Practical IA	0	0
SIF with Special Connection	1	3

There were no examples of SIF being coded in combination with practical IA. Again, this suggests that perhaps the practical aspect of intentional awareness is less important than the musical aspect. There were more examples of SIF being coded alongside musical IA in the performance than in the rehearsals. This could be because, as table 8 shows, there were more examples of SIF coded in the performance (14) than in the rehearsals (4). This strongly suggests a link between the process of SIF and the intentional awareness component of co-performer empathy. There were three instances of SIF being coded in combination with special connection during the performance, and one instance of them being coded together in the rehearsal. This suggests that there may be sometimes be a link between SIF and the special connection component of co-performer empathy.

There were examples of SIF being coded at the same moment by different players. Table 5.10 shows the number of times SIF was coded by two players at the same moment.

Table 5.10. Number of times SIF was coded by two players at the same moment

	Rehearsal (01:31:03)	**Performance (00:09:03)**
SIF	0	3

There were no examples of SIF being coded at the same time by different players during rehearsals, but there were three examples during the performance. This suggests that it was possible for different performers to perceive the ensemble to be achieving SIF at the same moment, but that performers often perceived moments of SIF individually.

All participants identified more moments of perceived SIF during the performance than during the rehearsals. The relatively high incidence of SIF being coded alongside both intentional awareness and special connection in the recall logs, particularly during the performance, suggested that the players perceived there to be a connection between experiencing co-performer empathy and a moment of SIF. In response to the second research question for this study – do expert musicians experience SIF at the same moment – three examples of SIF being coded by two players at the same moment were logged during the performance.

5.4.2 The Process of SIF

Figure 5.2 shows the model of the process of SIF in expert ensemble playing, determined by the analysis of the recall logs and interviews.

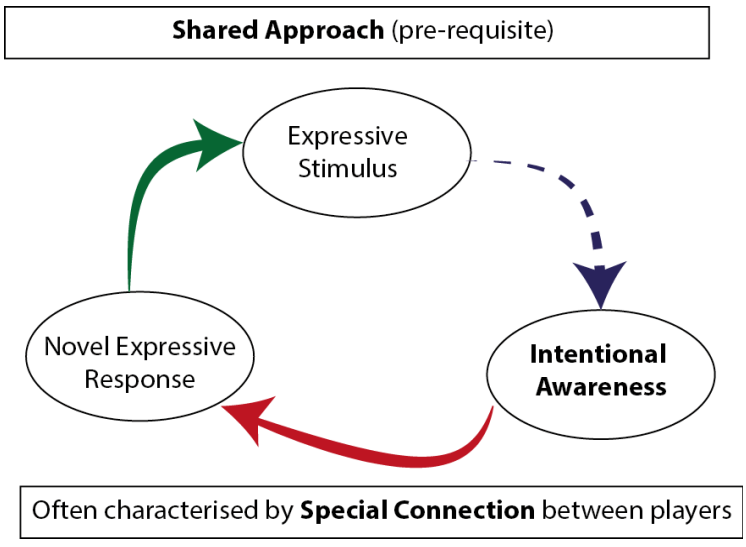

Figure 5.2. SIF in expert ensemble playing

The model involves the two components of co-performer empathy (intentional awareness and special connection) and a prerequisite shared approach, as identified in the focus group study. The process was determined from the recall logs and interviews

in which the players described the way the different components were used in order to achieve SIF. SIF in performance seems to arise as a result of a two-step empathic process involving an intentional awareness of the expressive intentions of one's co-performer(s) followed by an intentional or instinctive response. It was often (though not always) characterised by a special connection between players.

The process begins with an intentional awareness, a sort of musical perspective taking, in which a player will shift the focus completely away from her own part and force herself to listen to another player's part completely. The cellist gave an example of this kind of perspective-taking in a moment of intentional awareness, special connection, and SIF that she had logged during the performance:

> There's a bit just after the double bar, and the first time we play it the first violin goes really quiet and then goes back to the opening so it kind of just falls into that. But the second time we do it, it goes *subito forte*, and we all come crashing in. And so in those few bars before the crash when [the first violinist] is playing on her own, we all have to be in the zone as they say, and essentially playing her part in our mind so we can all just come in.... I don't think you could be sitting there just counting the bars' rest because it wouldn't have the same feeling as if you were actually totally involved, even though you're not playing. (Cellist)

The act of musical perspective taking here is that of the three lower players intentionally imagining playing the leader's part with her. This mental process akin to empathic perspective taking allows players to identify the musical or expressive intentions of a colleague, through an intentional awareness, and to then respond, creating a moment of SIF. It seems to be similar to Seddon's (2005) notion of "decentering" in that it requires the players to shift from an individual focus in order to be intentionally aware of the actions of their co-performers.

It is necessary not only that players identify their colleagues' musical intentions, but that they also respond accordingly – the second step in the process. As the first violinist observed: "You can't be aware of what someone else is doing on a musical level and then not respond. You wouldn't purposefully not respond would you?." All players agreed that there was a response, but there was no conclusive consensus as to whether the response was intentional or instinctive, with all participants suggesting that

perhaps it was a bit of both depending on the circumstances of a particular moment or of a particular performance. This essential second step in the process for SIF lends further support to the findings of existing studies (Davidson, 1997; Keller 2008, 2012). Responding in the moment to the novel expressive variation produced by one player completes the process of SIF in ensemble playing.

SIF in performance seems to arise as a result of a two-step empathic process involving an intentional awareness to identify the expressive intentions of one's co-performer(s) and a response. If this is the case, parallels can be drawn with the process of empathic responding more generally. One of the longest-standing debates in the field of empathy research has been over whether empathy is primarily a cognitive or affective phenomenon. More recently a movement has begun towards the wide acceptance of empathy as both a cognitive and affective process. In simple terms, the argument made for empathy as a dual cognitive-affective process is that it is impossible to have an instinctive, affective reaction to an individual's suffering without first having undergone even a subconscious cognitive process to evaluate that individual's state in order to be able to respond appropriately (Baron-Cohen, 2011). The process of empathy, then, is a two-step process involving cognitive perspective taking to evaluate an individual's state, followed by an appropriate affective response to that state. Baron-Cohen (2011) has defined empathy as "our ability to identify what someone else is thinking or feeling, and to respond to their thoughts and feelings with an appropriate emotion." There are clear similarities between this process of empathy and the process of SIF in ensemble playing.

Just as in the process of empathy, the results of this study suggest that is impossible to respond to a co-performer's expressive stimulus without first having some kind of intentional awareness of how that co-performer is operating on a musical level. Intentional awareness allows players to identify or anticipate their co-performer's expressive intention and respond to it, to create a moment of SIF. The parallels that can be drawn between the process of SIF and the process of empathy more broadly, further suggest a close relationship between SIF and co-performer empathy. Figures 3 and 4 show the similarities between the two processes:

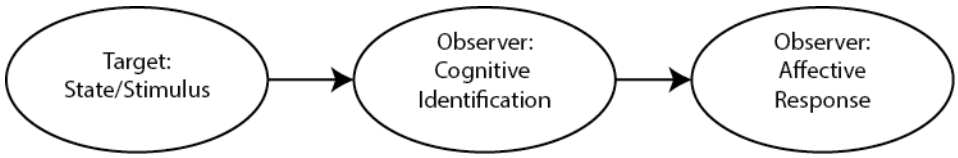

Figure 5.3. The process of empathy (Baron-Cohen, 2011)

Figure 5.4. The process of SIF in ensemble playing

Since there appear to be striking parallels between the process of SIF in ensemble performance and the process of empathy more generally, it may be plausible to consider SIF as a special, musical case of empathy.

Analysis revealed that a process of SIF is often characterised by a special connection between players. All four players suggested that an intentional awareness of their co-performers during performance often led to the establishment of a special connection between the members of the ensemble. The viola player described musical perspective taking through an intentional awareness as beginning as a conscious, intentional process but then developing into something more:

> Yeah it is on a conscious level, but then it sort of evolves to a bigger picture which I think is great – really useful.... So that's a good technique that we've kind of used to aim for the whole in each others' heads type thing. (Violist)

She saw musical perspective-taking through an intentional awareness of the actions of her colleagues as a means of achieving a special connection with them, and eventually leading to SIF during performance.

The example given by the cellist earlier of imagining playing the first violin's part was also given as an example of a moment where the player perceived there to be a

special connection between members of the quartet. This suggests that at least some instances of SIF must be characterised by a special connection between players.

5.4.3 The Process of Co-performer Empathy and its Relationship to SIF

It seems likely from the results of this study that SIF is a case of intense co-performer empathy. Figure 5.5 shows the process of co-performer empathy.

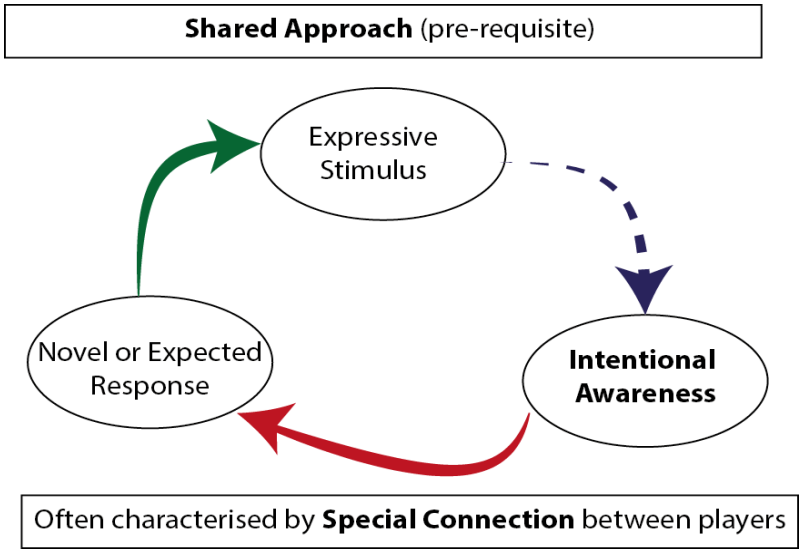

Figure 5.5 The cyclical process of co-performer empathy/SIF

Expert ensemble performance seems to involve a continually cycling process of co-performer empathy. At the end of a single cycle, a player's response becomes the new musical/expressive stimulus and the process is repeated. Whether or not a co-performer's empathic response is classed as an example of SIF depends on whether the response is expected or novel.

A shared approach is still an essential pre-requisite for both co-performer empathy and the more intense case of SIF. It is imperative that players still share the same vision of musical interpretation, because a disagreement over how the music should be interpreted could end in disaster. Intentional awareness from all players is also vital. It is important that players are sensitive to how their colleagues were operating on a musical level, to avoid "bulldozing" through the music, ignoring the other players' parts. However, when an ensemble strives for SIF, both the shared approach prerequisite

condition and the intentional awareness component of co-performer empathy take on a greater importance. The production of novel expressive variations in the moment requires greater intentional awareness since actions are not pre-planned, and the response to a player's expressive variation (stimulus) by other players has to be based on a shared approach to musical interpretation.

The cyclical process of co-performer empathy should occur throughout a performance. Players must constantly be intentionally aware of the expressive actions or intentions of their colleagues in order to be able to respond appropriately to them throughout the performance. If the expressive actions are pre-planned, then the response is more predictable. However, if one player produces a novel expressive variation in the moment, other players must be aware that this has occurred, and adjust their response accordingly. In this way, ensemble performance is a constantly evolving process of empathic responding through which there is the optionality for a piece to be performed differently every time. Players may choose to adhere strictly to a pre-planned interpretation, reproducing a previous performance as closely as possible. They may create an entirely new interpretation, requiring an intense process of co-performer empathy: SIF. They may choose to use a combination of these two extremes, in places adhering to a pre-planned interpretation, and in other places creating moments of SIF. In all cases, the process of co-performer empathy is essential and must be present throughout.

The process of co-performer empathy seems likely to often be characterised by a special connection between players. In light of the findings of the focus group study on the relationship between co-performer empathy and optimal experiences of ensemble performance, it is possible that a special connection between players is perceived as more prevalent during the empathic process in optimal experiences of ensemble performance.

5.5 CONCLUSION

Addressing the first aim of this study – to find further evidence in support of the components of co-performer empathy identified in the focus group study – analysis of the participants' recall logs and interviews found further evidence in support of the intentional awareness and special connection components of co-performer empathy. However, although intentional awareness was found to be an essential component of co-

performer empathy, there was evidence that the practical aspect of intentional awareness was less important than the musical aspect for the string quartet in this case study.

The second aim of this study was to construct a model of the process of SIF in expert ensemble performance. The results of the analysis of the recall logs and interviews permitted the construction of such a model. SIF was found to be grounded in a pre-requisite shared approach to the music and to working together, and involved a process of identification and response akin to empathy, involving an intentional awareness of co-performers' intentions, and often characterised by a special connection between players.

In response to the third aim of the study, to construct a model of the process of co-performer empathy, it was found that co-performer empathy involved a similar process to SIF. However, whilst the empathic process involved in SIF resulted in a novel response, in the process for co-performer empathy, the response could be novel or expected. This also addressed the fourth aim of the study concerning the relationship between co-performer empathy and SIF. SIF was determined to be a case of intense co-performer empathy. Both the process of co-performer empathy and that of SIF were found to be characterised in some instances by a special connection between players. It is not clear from the present study what might influence the presence of a special connection, although one participants suggested that it was sometimes based on the external circumstances of a particular performance such as occasion, audience, or nerves.

In terms of the first research question (Do expert ensemble musicians perceive there to be a connection between experiencing co-performer empathy and achieving SIF during a performance?), analysis of the recall logs suggested that the musicians in this case study did perceive there to be a connection between experiencing co-performer empathy and achieving SIF during a performance. SIF was coded seven times in combination with intentional awareness during performance, and 3 times with special connection. During their interviews the participants also suggested that SIF was dependent on a process of musical perspective-taking involving an intentional awareness of the intentions of their co-performers. In response to the second research question (Do expert ensemble musicians experience SIF at the same moment?), analysis of the recall logs found three examples of SIF being coded at the same moment by two players. This suggests that it is possible for ensemble musicians to perceive that they are experiencing SIF at the same time, although not always.

The main limitation of this observational study was that it was a case study based on only one ensemble. Unfortunately, the results of the pilot study were inconclusive so could not contribute to the findings of the main study. From the findings of this study, it was determined that further work should be undertaken to test the process for co-performer empathy in expert ensemble playing constructed in the present study. One possibility was to examine SIF in greater depth as an indicator of co-performer empathy, and this was the main aim of the next study.

CHAPTER 6. STUDY 3: EXTENDED OBSERVATIONAL CASE STUDY WITH ACOUSTIC ANALYSES WITH A STRING QUARTET

6.1 INTRODUCTION

The observational case study reported in the previous chapter found that this kind of SIF in ensemble playing is a process of intense co-performer empathy, in which players identify the expressive intentions of their co-performer(s) through an intentional awareness, and then produce a novel response. SIF is often characterised by a special connection between players and is grounded in a pre-requisite shared approach both to the music and to working together. Figure 6.1, below, shows the model of the process of SIF in expert ensemble playing.

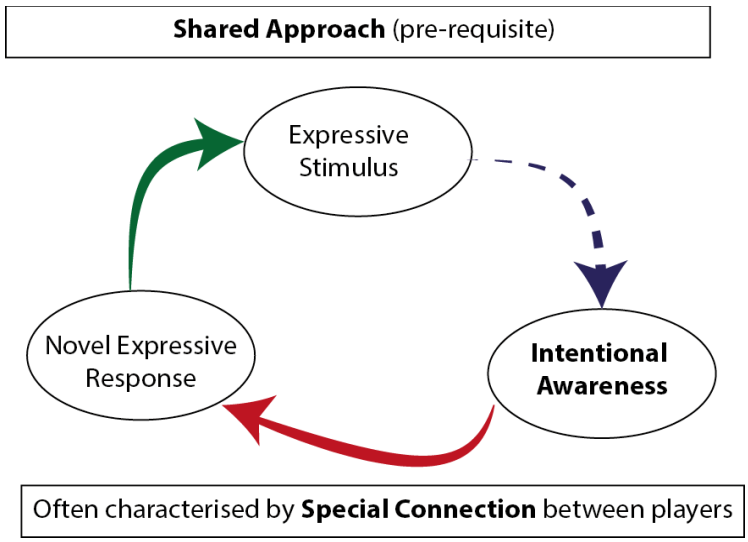

Figure 6.1. The process of SIF in expert ensemble playing

Expert ensemble performance seems to involve a continually cycling process of co-performer empathy. At the end of a single cycle, a player's novel or expected response becomes the new expressive stimulus and the process is repeated. Whether or not a cycle of co-performer empathy is classed as an example of SIF depends on whether a response is expected or novel. If a response is expected rather than novel, then SIF does not occur. It seems likely that cycles of co-performer empathy occur throughout an

expert performance, since all players are required to be alert to the intentions of their co-performers and ready to respond, whether in an expected or novel manner. In this way, the potential for SIF is always present in expert ensemble performance.

SIF emerges during expert ensemble performance as an organic and continuous group process. Since it was identified as an example of intense co-performer empathy in the previous chapter, it follows that SIF should be considered to be an indicator of the presence of co-performer empathy during ensemble playing. As such, it should be possible, by identifying moments of SIF, to identify moments when an ensemble is experiencing co-performer empathy with a degree of certainty. This is not to say that when players are not producing novel expressive variations during a performance that they are not experiencing co-performer empathy, but that it seems likely that when SIF occurs, the players are involved in an empathic process. The study reported here, therefore, investigated moments of SIF in the live performance of a single piece of repertoire by an expert ensemble.

There have been a number of approaches to exploring expressive variation in performance. Sundberg was one of the first researchers to make great strides in the acoustic analysis of expression in performance. Sundberg, Iwarsson, and Hagegård (1995) used an empirical acoustic method of analysis to investigate a professional baritone's expression of emotion in song performance. Acoustic analyses were conducted on five specific areas of the music. Tempo was defined as the inverted mean duration of the shortest note value present in the excerpt. Short-term variability of sound level was calculated by computing the time derivative of the sound level curve smoothed with a 20hz low pass filter. Overall sound level, vowel-to-vowel duration and F0 patterns were also analysed. This kind of acoustic analysis approach has been used and developed in many studies since. Most recently, the *Sonic Visualiser* software has been developed by researchers at the Queen Mary, University of London as a means of more accurately measuring various acoustic properties for empirical analysis (Cannam, Landone, & Sandler, 2010). Other approaches to investigating expressive variation in performance have taken a variety of different approaches. Some have sought to compute rules for reproducing expressive performances (e.g. Juslin, Friberg, & Bresin, 2002), whilst others have involved the perceptual evaluation of performers' expressive variations by both expert and inexpert listeners (e.g. Davidson, 1993). For a review of existing literature on expressivity in music performance, see Juslin and Timmers (2010).

Although many studies have examined expressivity and flexibility in

performance, very few studies have focussed on ensemble rather than solo performance, and so far only Seddon (2005) and Seddon and Biasutti (2009) have explored the idea of expressivity and empathy in ensemble playing. Seddon (2005) and Seddon and Biasutti (2009) investigated modes of communication in ensemble playing in both jazz and classical genres, using a qualitative approach, involving analysis of verbal and non-verbal communication in combination with interviews. These studies introduced the concept of "empathetic creativity" as a phenomenon arising when a group of performers is "empathetically attuned." It seems likely that empathetic creativity as defined by Seddon is similar to the process of SIF investigated in the present study. However, the researchers applied different terminology to the concept of expressivity in ensemble playing, using the terms "sympathetic attunement" and "empathetic attunement" based on Arnold's (2004) theory of empathic learning. Since the aim of their studies was to investigate modes of communication rather than a process of empathy in ensemble playing, the researchers do not examine the processes behind sympathetic attunement, empathetic attunement, or empathetic creativity in detail.

There was one general aim for this study: to explore SIF in expert ensemble performance. However, there were four research questions:

1. Do co-performers in a chamber ensemble perceive themselves to be experiencing SIF at the same time?
2. Does an expert, independent observer perceive co-performers to be experiencing SIF at the same points in a performance as the players themselves?
3. What acoustic characteristics are present during moments of perceived SIF by the performers themselves?
4. What acoustic characteristics are present during moments of perceived SIF by the independent observer?

6.2 METHOD

6.2.1 Participants

The participants for this study were the members of an expert, established string quartet who had been playing together for over three years, had won several prestigious prizes, and held a fellowship at the European Chamber Music Academy (female, 4; M = 23

years). This was the same group as in Study 2, with the same set of video and audio data as detail below. However, this study also involved an expert independent observer (male, 26 years) who was the leader of a professional string quartet. This group did not participate in study 1 or study 4. The group were not known to the observer. The observer participated as part of the violin duo in study 4.

6.2.2 Materials

A Sony *Handycam* camcorder, tripod, and *H2 Zoom* recorder were used to record the ensemble's rehearsals and performance. *Audacity* software and *MPEG Streamclip* video editing software were used to cut the recorded data into excerpts. *Sonic Visualiser* software was used to conduct the acoustic analyses. Participants were issued DVD copies of video excerpts and video recall log sheets to carry out their video-recall coding (see Appendix IV for sample log sheet and instruction pack).

6.2.3 Procedure

As described in Study 2, a rehearsal and a performance of Schubert's *Quartettsatz* were video- and audio-recorded within the space of a week. No external observer was present during the rehearsal recordings. Video footage of the rehearsals (1.5 hours) and the recital performance of the same piece (9 minutes) were burned to DVD and given to the quartet members along with an instruction pack and a video recall log sheet. Using a code-specific video recall method, all four players were given a project pack containing an instruction sheet, DVD containing all four excerpts, and a log sheet to be completed. They were asked to view the excerpts and identify moments which fell into two categories: co-performer empathy (moments when participants experienced intentional awareness (musical or practical), or special connection), and SIF (moments when participants felt they were producing novel expressive variations or being creative in their approach, playing, or interpretation). Following completion of the logs, all participants were interviewed individually and asked to identify moments exemplifying each theme to describe in more detail, as well as being asked a series unstructured interview questions relating to the coding process. Participants were asked about SIF in particular, and its relation to the components of co-performer empathy in their experiences of the coding process (see Appendix II for interview guide).

6.2.4 Analysis

The analysis for this observational study was in three parts. The first part concerned the quartet's individual video recall logs and interviews. A thematic analysis was conducted on the interview transcripts to explore the data and to identify any common themes. These were then examined and interpreted in relation to the participants' recall logs. A comparison of all of the recall logs was undertaken to identify any moments in the video data where participants had agreed on coding. The same coding frequency results were used as for Study 2, but the focus for this study was on SIF in particular.

The second part of the analysis was a perceptual evaluation of the audio recordings by an expert independent observer to identify moments of perceived SIF. Moments of SIF identified in this evaluation were then compared to moments identified by the quartet themselves, and differences and similarities were noted.

The third part of the analysis involved an acoustic analysis of audio excerpts from rehearsal and performance using *Sonic Visualiser*. *Audacity* was used to cut musically meaningful passages from rehearsal audio recordings and corresponding passages from the performance recording. Musically meaningful passages were considered to be any sections which were of sufficient length for the listener to gain a sense of the musical context of the excerpt. Examples of musically meaningful passages for this piece were, the introduction, the first statement of the first subject, the second statement of the first subject, the second subject, and so on. Volume and tempo were mapped out for each excerpt using *Sonic Visualiser*. Beats were marked out to measure variations in tempo, and a power curve representing the volume levels across each excerpt was drawn. Tempo and volume data for each rehearsal excerpt were compared to those for the corresponding performance excerpt and, since the *Quartettsatz* contained a repeat of the exposition, first and second time interpretations of the same section of the performance were also compared.

6.3 RESULTS AND DISCUSSION

Since the analysis for the main study was in three parts, the results of the main study will be presented in three parts. Part one will report the findings of the video-recall analysis. Part two will report the expert independent observer's ratings of perceived

SIF. Finally, part three will present the results of the acoustic analyses of the audio data.

6.3.1 Part One: Video-Recall

Instances of SIF were coded by all participants, although few examples were logged by any of the participants during the rehearsal. SIF was much more prevalent in the performance clip, and was coded more often than any of the other components. Table 6.1 shows the frequency of coding of SIF by each player for the rehearsals and performance.

Table 6.1 Frequency of coding of SIF by each player

Player	**Rehearsal (01:31:03)**	**Performance (00:09:03)**
V1	0	5
V2	1	1
VA	1	2
VC	2	6

When asked during interviews why they thought that SIF had been more prevalent in the performance, participants answered that SIF was something they strived for in performance, whereas during rehearsals the focus was usually on agreeing on and then establishing the best possible interpretation of the music. The leader commented that she would not describe the process of playing many different interpretations in quick succession during rehearsals as SIF because the ensemble simply discuss and then immediately play a variation of interpretation, so there is no true spontaneity.

> In rehearsal we're trying to find the best way. We're trying to find a solution that we all like and so.... you're concentrating on very specific aspects and it's, it's difficult and often we end up stop-starting a lot because you want to get it right.... Whereas, in a performance you have all of that in mind, but then there's this added dimension of, you know, "how can I keep it alive and different," so you do all the things that you rehearsed but you try and exaggerate all those things that you rehearsed, and then do something on top of that. (First Violinist)

SIF in performance, she explained, is absolutely spontaneous. It is an unspoken agreement in the moment to do something other than the pre-planned interpretation.

Interestingly, all players apart from the first violinist stated that the *Quartettsatz* did not lend itself very well to moments of SIF, because they perceived it as a solo piece for the first violinist with the other parts accompanying. The first violinist agreed that it was quite a soloistic piece for her, but she believed that there was still plenty of scope for SIF from all players, since SIF is a group process.

> Even though their parts aren't as rich.... it's hard to sort of say that they don't have as much flexibility because.... the music is only what the four of us create together. So even if in a moment I make a certain sound because at that point I feel able to do that, they can react musically, and it's not like I owned that moment, we all did it together. Maybe I instigated it, but equally they can do that from their parts as well.... We're creating something as a whole. Not as four individuals. So, really it's hard to kind of single people out as having more flexibility because really one person's flexibility is everyone's flexibility. (First Violinist)

The first violinist suggests here that SIF is a continuous group process involving identifying the expressive intentions of other players at any point within the music and then responding accordingly. This lends further support to the model of the process of SIF set forth in the previous chapter, as well as existing research (e.g. Blum, 1986; Keller, 2008, in press).

Since the players focussed on the exposition of the Schubert in their rehearsals, the analysis that follows will focus only on the exposition (bars 1–140). Six moments of SIF were coded during the exposition in the performance. There were three of these six examples of SIF were coded by two of the four players at the same time. This agreement over these three moments might suggest clearer or more intense moments of SIF with better-defined acoustic characteristics. Table 6.2 shows the frequency of coding of SIF by each player.

Table 6.2. Instances of SIF coded by each player during the exposition section (bars 1–140) in the performance

Bar(s)	**Brief description**	**V1**	**V2**	**VA**	**VC**
From b.23 (P1)	Tempo: Violin 1 rubato, varied.	X			X
From b.43 (P1)	Tempo: More time taken in P1.	X			
From b.87 (P1)	Dynamics: Cello bass-line. Tempo: Timing of upper chords			X	X
From b.9 (P2)	Character: Violin 2 more restless, violin 1 reacts. Colour: Change in colour created, reflecting felt change in harmony.	X	X		
From b.38 (P2)	Tempo: Violin 1 takes time over barline in P2.				X
From b.81 (P2)	Tempo: Cello starts the new section more slowly. Character: Different upbeat affects the character of the new section.	X			

(P1 = first time through the exposition section during the performance; P2 = repeat of the exposition section during the performance)

Interestingly, no examples of SIF were coded by any player between bars 93 and 140. This was the section that the quartet spent most time rehearsing with a metronome and agreeing on an interpretation for during the rehearsal clips. It is possible that the players decided to "play it safe" perhaps, and adhere more strictly to their pre-planned interpretation here.

The second violinist and violist both only coded one moment of SIF during the exposition, shown in Table 6.2, and the violist coded one more towards the end of the piece. This could be a reflection of their perception that this particular piece did not afford many opportunities for either of their parts. Both mentioned this during the interviews and both made a similar comment at the end of their logs. Both noted that the performance was, as always, more flexible than rehearsals but neither coded any further

specific instances of SIF. Keller (2008) found that ensemble performers are subject to prioritised integrative attending, in which paying attention to one's own actions takes a higher priority than those of one's co-performers, and monitoring the overall ensemble sound. Waterman (1996) also found that performers exhibited greater awareness of self than of their co-performer when reviewing their performances. Waterman noted that it was interesting that expert performers were able to monitor and respond to their duo partner in performance but were unable to report that monitoring explicitly after the performance. The results of the present study regarding the second violinist and violist's perceptions of SIF seem to support these findings.

The first violinist coded most instances of SIF in the performance. Similarly, this could be a reflection of her perception of the piece, and her own part in particular, as offering more scope for SIF. Instances of perceived SIF related either to tempo variation or to a change of character or colour. She commented not only on what she perceived as her own SIF, but also moments when she perceived that another player had done something spontaneous and she, or the rest of the quartet, had responded. Similarly, the cellist coded instances of SIF in which she perceived the first violinist as having done something unexpected, and the whole the quartet had reacted. Two of the instances coded by the cellist were related to tempo variation; the third to dynamics. The cellist was the only one of the performers who logged an instance of SIF related to dynamics. However, the first violinist also mentioned dynamic variation as a means of achieving SIF during the interview when she was speaking of the phenomenon in more general terms.

Coded moments of SIF were compared with the coded examples of components of co-performer empathy identified by the performers. Table 6.3 shows all six instances of SIF from the exposition section of the performance, and indicates whether they were coded alongside special connection or intentional awareness. Participants' identities are also indicated in brackets. SIF was only coded by itself once during the exposition section of the performance. However, there were examples of it being coded alongside both intentional awareness (five examples by three of the participants) and special connection (two examples by two of the participants).

Table 6.3. Moments of SIF coded in combination with components of co-performer empathy

Bar	**Brief description of SIF**	**Special Connection**	**Intentional Awareness**
From b.23 (P1)	Tempo: Violin 1 rubato, varied.		X (VC)
From b.43 (P1)	Tempo: More time taken in P1.	X (V1)	X (V1)
From b.87 (P1)	Dynamics: Cello bass-line. Tempo: timing of upper chords		X (VA)
From b.9 (P2)	Character: Violin 2 more restless, Violin 1 reacts. Colour: Change in colour created, reflecting felt change in harmony.	X (V2)	X (V1)
From b.38 (P2)	Tempo: Violin 1 takes time over barline in P2.		
From b.81 (P2)	Tempo: Cello starts new section more slowly. Character: Different upbeat affects character of new section.		X (V1)

That SIF was coded so frequently alongside the intentional awareness component of co-performer empathy is reflected in the model of the process of SIF (see Figure 6.1). The model shows intentional awareness to be essential for the identification stage in the process of SIF. The model also suggests that the process is often characterised by a feeling of a special connection between players. Two of the six moments of SIF logged here were characterised by a special connection between players.

6.3.2 Part Two: Perceptions of the Expert Independent Observer

An expert independent observer was recruited to evaluate perceived SIF during the performance. He was the leader of a professional string quartet and, as such, was familiar with the repertoire and technical concerns. It was decided a string specialist, particularly a quartet player, would be the best placed to judge moments of SIF as the

specialist technical knowledge would allow him or her to appreciate more keenly variations in tone colour, bow speed, vibrato, and so on. It is possible that his personal knowledge of the *Quartettsatz* could have affected his evaluation of moments of SIF in this quartet's version. However, it was felt that the benefits of the independent observer being a quartet specialist in terms of in-depth technical and ensemble knowledge out-weighed this concern. The independent observer was given a coding sheet similar to those given to the quartet. However, he had access to the audio excerpts of the rehearsals as well as to the video excerpt of the performance. This was because, unlike the quartet, he was not familiar with the quartet's rehearsal interpretation of the piece as a point of comparison for SIF during the performance.

All excerpts were taken from the exposition section of the *Quartettsatz* since this was as far as the recorded rehearsed material extended. Since this section was repeated during the performance an opportunity arose to compare the first and second-time interpretations during the performance as well as comparing the first-time interpretation to the rehearsal interpretation. This resulted in three conditions: rehearsal (R), first time through the exposition section in performance (P1), and second time through the exposition section in performance (P2). With regard to judging moments of SIF, it was decided that P1 should be compared to R, taking the rehearsal interpretation (R) as its baseline, and P2 should be compared to P1, taking the first-time performance of the exposition (P1) as its baseline. This was because the quartet stated during the interviews that they had intended to make the second-time interpretation different from the first during the performance. Therefore, their only point of comparison for the second-time interpretation was what had gone immediately before during the performance (P1), regardless of what had been established in the rehearsals since they had never rehearsed the repeated section. The independent observer was, therefore, asked to identify and comment on any moments of perceived SIF during the performance, by comparing P1 to R, and P2 to P1.

The purpose of the independent observer's evaluation was to create another point of comparison to aid in exploring and interpreting the quartet members' recall logs, and the results of the acoustic analysis. The acoustic analysis only examined SIF in performance in terms of tempo and volume variation. However, tempo and volume are only two potential parameters that can be varied for SIF. Having an independent observer listen objectively to the recordings of the three conditions and identify moments when he perceived the quartet to be achieving a level of SIF during the

performance conditions (P1 and P2), gave a better indication of some common features of moments of SIF in the performance which could then be identified and explored alongside the findings of the acoustic analysis.

The independent observer identified 17 instances of SIF altogether during the exposition section of the performance (see Table 6.4 below). This was more than the six instances identified by the quartet. This could have been because he had access to the rehearsal recording to draw more objective, direct comparisons (between P1 and R, and P2 and P1), whereas the quartet had to rely upon their memory or understanding of their established interpretations. It is probable that since the independent observer was not familiar with the quartet's interpretation of the *Quartettsatz*, he analysed the recordings more carefully and objectively than they did.

Table 6.4. Perceived moments of SIF coded by the independent observer

Bar/Beat	**Brief description of SIF**
Comparison of P1 to R	
12.5–13	More time taken over the second half of the bar to allow for a slower vibrato amplitude decay in V1 before bar 13
17	Greater rubato on beat 1
25–26	More time taken in P1 than R
34–36, 39–61	VC is less servile, with stressed half-bars in 34–36, and more sonorous playing in 39–61. The part is more of a counter-melody than an accompaniment. V1 is forced to be more flexible with colour choices.
80, (5–6)	VC drags the last two quavers to place the unexpected transition into the new key.
87–90	Less of a contrast in colour, moving from *poco vib.* and "core," to *molto vib.* and "float."
112–113	Entry into 113 more together in P1 than in R.
139	V1 tempo more constant in P1 than in R. The real moment of flexibility here is when the other players are forced to cohesively react to what V1 has given them, and enter together after the solo.
Comparison of P2 to P1	
5–8	The *crescendo* is more enthusiastic and the tempo moves forward. Ensemble is tighter than in P1, as each player better anticipates their entries.

9	More time taken on the *ffz*.
10	More time taken on the *fp*.
11–12	More rubato used in P2.
17–18	Change in colour in the lower parts, allowing V1 to make more flexible choices in timing.
23– 26	Change in colour in the lower parts, allowing V1 to make more flexible choices in timing.
52	More rubato over the hairpin by V1. The other players seem not to react.
109–113	Less *dimuendo* in the inner parts forces V1 to take back the theme at a higher dynamic and prepare the colour change at 113 differently.
117–121	Less *dimuendo* in the inner parts forces V1 to take back the theme at a higher dynamic and prepare the colour change at 121 differently.

He described each moment of perceived SIF in great detail, explaining why he perceived the moment to be flexible, as well as placing it into a technical, ensemble context. When simplified into their fundamental characterising features, 13 instances related to tempo, three to dynamics, and seven to tone colour. There were two instances of SIF that were identified by both the quartet and the independent observer (bars 87–90, bars 9–12), although, interestingly, the descriptions of the properties of each moment were different (see Table 6.5).

Table 6.5. Moments of perceived SIF coded by both the quartet players and the independent observer

Bars	**Quartet**	**Observer**
87–90	Dynamics: Cello bass-line. Tempo: Timing of upper chords	Less of a contrast in colour, moving from *poco vib.* and "core," to *molto vib.* and "float"
9–12	Character: Violin 2 more restless, violin 1 reacts. Colour: Change in colour created, reflecting felt change in harmony	More time taken

The moments identified by the independent observer, along with those picked out by the quartet musicians, will be explored in relation to the acoustic analyses in the next

section.

6.3.3 Part Three: Acoustic Analysis Results

Sonic Visualiser was used to compare the different conditions (P1 to R, and P2 to P1) for each excerpt. Tempo and volume variation were examined. In exploring and interpreting the results of the acoustic analyses, it was decided that the process should begin with moments the quartet musicians had perceived as examples of SIF in their recall logs, followed by moments coded by the independent observer. The intention was to identify common characteristics in terms of tempo and volume variation for these moments of perceived SIF by musicians. The acoustic analysis results in isolation are not meaningful. They simply identify moments where the quartet's tempo or volume changed in some way. As a point of comparison, four other moments (two from P1, two from P2) which had not been identified as moments of perceived SIF by either the performers or the independent observer were also analysed.

6.3.3.1 Tempo

Each audio excerpt was slowed down in *Sonic Visualiser* and beats were marked in by the researcher. These figures were then input into Excel and converted into beat per minute values, rather than seconds per beat values, by inverting each score. This was done for each set of three conditions (R, P1, and P2) for each excerpt. The grand mean tempo for each condition was calculated in beats per minute for each excerpt. Each individual beats per minute score was then divided by the grand mean -1 and multiplied by 100 to give each individual score's percentage deviation from the grand mean tempo for each condition. This gave a set of individual scores for each condition showing the percentage deviation from the mean tempo of the excerpt at every beat (see Appendix IV for formulae). The percentage deviation scores could be positive or negative depending on whether each beat was faster or slower than the mean tempo for an excerpt. Working with scores of percentage deviation from the mean tempo for each condition, rather than just using the raw tempo scores, allowed a more accurate comparison between conditions for each excerpt. The tempo percentage deviation scores for the three conditions for each excerpt were then represented on line graphs to allow for easier visual comparisons of tempo variation between the three conditions to be made. An example for the first excerpt (bars 1–18) is given in Figure 6.2. below.

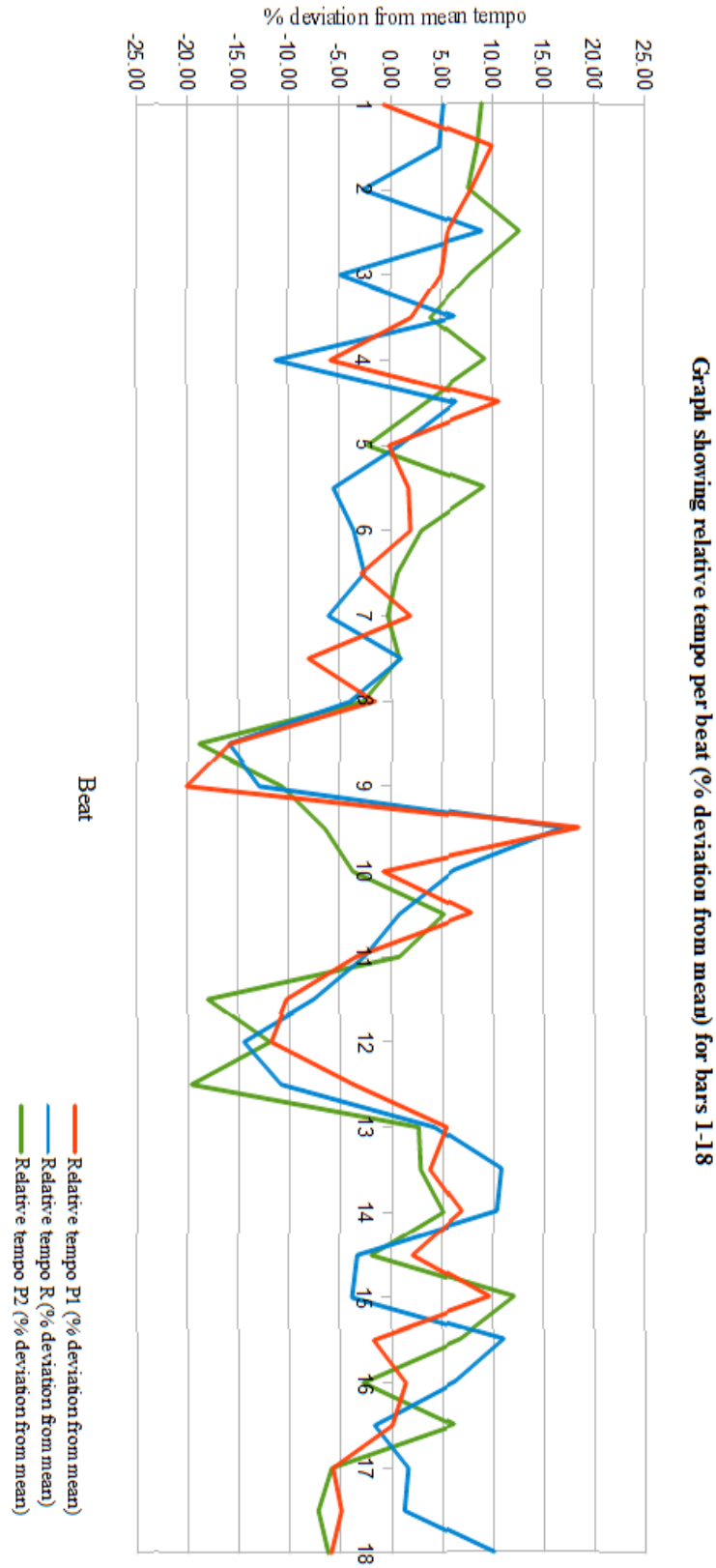

Figure 6.2. Graph showing tempo variation (% deviation from mean) for R, P1, and P2 (bars 1–18)

The bars logged as instances of perceived SIF by the quartet musicians were then identified within each excerpt, and the percentage deviation from mean tempo scores were compared to determine if any variations in tempo could be found at the corresponding beats. All six examples of perceived SIF from the quartet's recall logs corresponded with moments of variation in tempo according to the acoustic data (see Table 6.6). The participants tended to have only marked down one bar or a time stamp from the video to identify a moment. That moments of perceived SIF lasted longer than just a single beat was indicated by participants during the recall interviews. Therefore, in interpreting the acoustic analysis data, any variations in tempo in subsequent beats were also included by the researcher.

Table 6.6. Table comparing the quartet musicians' logged instances of SIF to the results of the tempo variation analysis

Logged beats	Brief description of SIF from recall log	P1 (% deviation from mean tempo)	R (% deviation from mean tempo)
23	Tempo: Violin 1 rubato, varied.	- 20.09	- 9.12
23.5		+ 12.34	- 5.12
24		+ 9.11	- 3.82
24.5		- 0.49	+ 9.06
43	Tempo: More time taken in P1.	- 8.23	- 1.33
44.5		- 8.39	- 0.42
45		+ 12.96	+ 3.82
45.5		+ 6.91	- 5
46		+ 8.25	- 0.23
46.5		- 9.51	- 0.33
87	Dynamics: Cello bass-line.	- 11.81	- 0.37
87.5	Tempo: Timing of upper chords.	- 3.51	- 0.37
88		- 1.33	- 14.76
88.5		- 13.7	- 4.76
89		- 0.96	- 10.8
89.5		- 18.03	- 9.44
Logged beats	Brief description of SIF from recall log	P2 (% deviation from mean tempo)	P1 (% deviation from mean tempo)
9	Character: Violin 2 more restless, violin 1 reacts.	- 10.63	- 12.87
9.5		- 6.38	+ 16.99

10		- 3.67	+ 6.23
10.5	Colour: Change in colour created,	+ 5.30	+ 0.9
11	reflecting felt change in harmony.	+ 0.9	- 2.85
11.5		- 17.94	- 7.53
12		- 11.96	- 14.52
12.5		- 19.68	- 10.87
38	Tempo: Violin 1 takes time over barline in	- 3.09	+ 1.67
38.5	P2.	- 3.09	+ 5.17
81	Tempo: Cello starts the new section more	- 18.97	+ 0.36
81.5	slowly.	- 5.13	- 7.28
82	Character: Different upbeat affects the	+ 3.43	+ 11.27
82.5	character of the new section.	+ 2.62	- 3.87
83		- 0.66	- 12.99
83.5		- 4.96	- 10.76

From studying the table of comparisons above, it was possible to identify some common characteristics relating to the tempo variations for the logged instances of SIF. All logged instances of SIF involved variations in tempo. Unfortunately, the sample size was too small for the calculation of a specific level of percentage deviation difference between two conditions to be mathematically meaningful or generalisable. However, since all of the instances of perceived SIF appeared to involve variations in tempo, it is likely that variations in tempo are good indicators of moments of SIF as perceived by the quartet musicians for this particular piece of repertoire.

There appeared to be no discernible difference in terms of tempo variation between the three moments of perceived SIF logged by individual players and the three logged by two of the players.

The tempo variation in bars 43–47, an instance of SIF logged by the first violinist, is shown in Figure 6.3 below. These graphs are helpful visual representations of the tempo variations between the interpretation conditions with reference to the musical score. They allow the tempo variations to be placed into a useful musical context as well as a mathematical one.

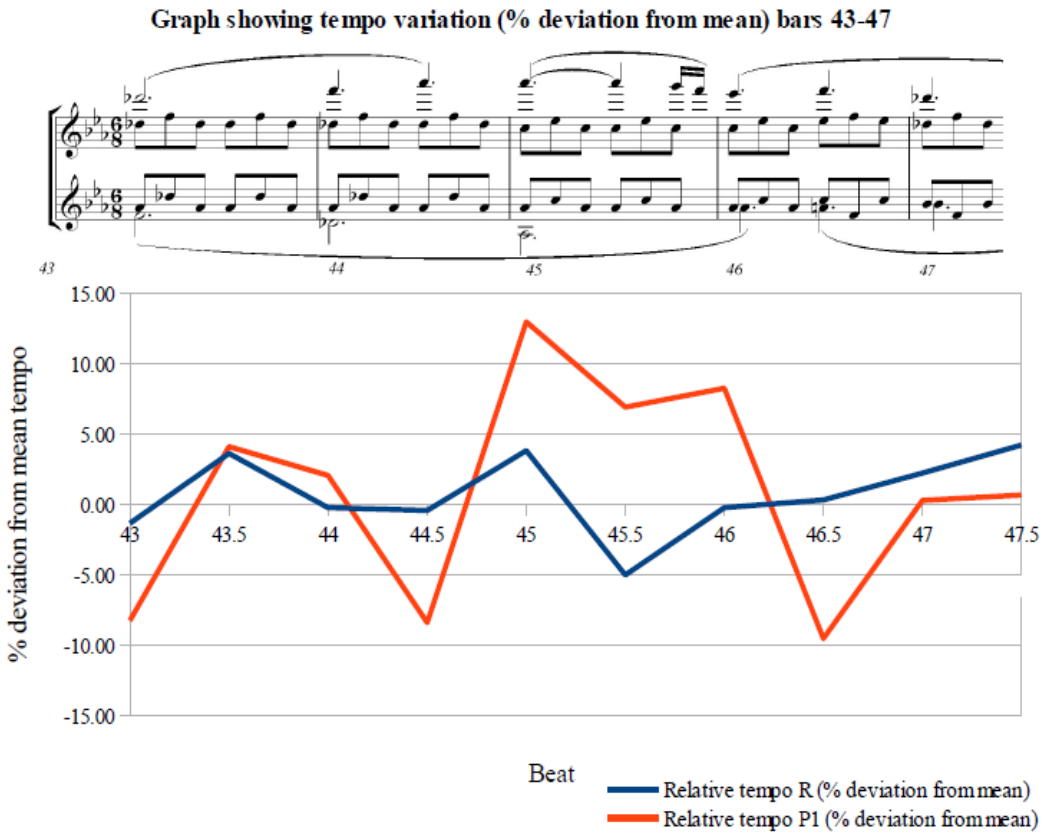

Figure 6.3. Graph showing tempo variation between P1 and R for bars 43–47

The tempo variation line representing P1 has a much wider deviation from its mean tempo than does the line representing R. This shows that there was a much greater variation to both extremes of tempo in the first-time play of the exposition in the performance than there had been in the rehearsal. This suggests that perhaps the first violinist, who has the melody shown in the graph, decided to add some rubato in the performance, despite having rehearsed these bars in a straighter manner as indicated by the narrower rehearsal line. The other players would have to recognise the leader's rubato and adjust and respond accordingly, resulting in a moment of SIF from the whole ensemble.

An example of perceived SIF logged by both violinists is given in Figure 6.4. This was an example of SIF between P2 and P1 in bars 9–12 of the performance.

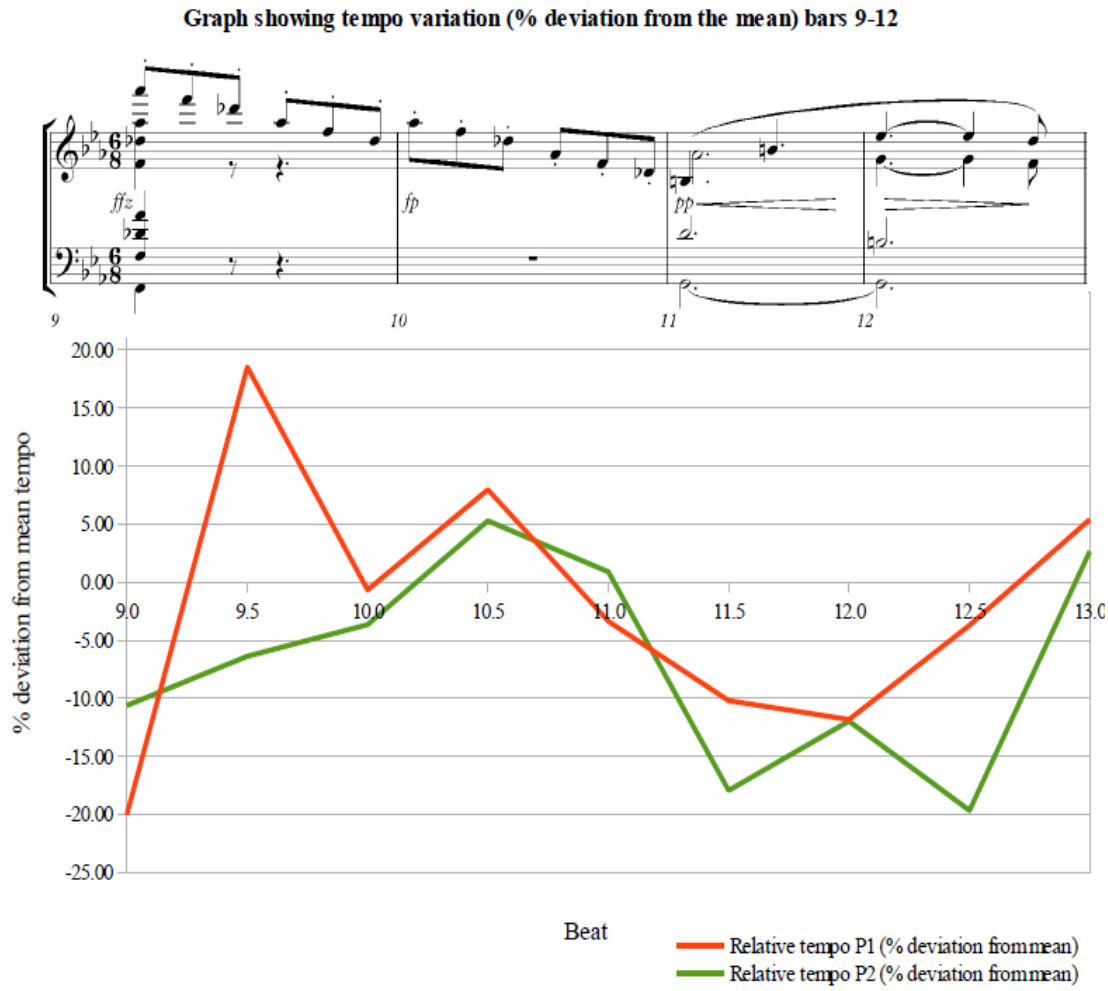

Figure 6.4. Graph showing tempo variation between P2 and P1 for bars 9–12

The graph shows that P2 was generally slower than P1 relative to their respective mean tempos. Bar 9 was an example of two extremes of tempo for P1 with the first beat being relatively slower than that of P2 and the second being far quicker. The quartet seem to have drawn out the second beats of bars 11 and 12 much more the second time through the exposition during the performance. The line representing the tempo variation for P2 descends lower on these beats than does the line representing P1. As can be seen on the graph, the part of the score associated with beat 12.5, is the upbeat into a new section. The upbeat also serves as a cadence into C minor, re-established on the downbeat of the following bar. The tempo lines show that the cadence is more exaggeratedly drawn out by the players in P2, whereas it seems to have been played relatively straight in P1.

Having explored the tempo variation data in relation to the quartet's instances of perceived SIF, the same procedure was repeated using the independent observer's

logged instances of perceived SIF. The table below shows the instances of perceived SIF logged by the independent observer in relation to the tempo variation data from the acoustic analysis (see Table 6.7). Two instances of perceived SIF have been omitted from the table because they exceeded 30 bars and were related to sound or colour rather than tempo.

Table 6.7. Table showing the independent observer's logged instances of SIF in relation to the tempo variation results of the acoustic analysis

Bar	Brief description of SIF	P1 (% deviation from mean tempo)	R (% deviation from mean tempo)
12.5	Tempo: More rubato. Wider vibrato in first violin.	-3.72	-10.87
17	Tempo: Greater rubato on beat one.	-3.74	-2.62
25–26	Tempo: More stretched in P1.	-39.82 +1.8 -19.24 +6.06	-40.59 +11.65 +11.65 -1.89
34–36	Character: Different sound and character – cello. Colour: Different colour – violin	-2.17 -0.86 +3.08 +2.47 +1.67 -9.35	+2.63 +3.62 +4.22 +5.24 +4.22 -6.65
80.5	Tempo: Cello places upbeat into the new section later.	-27.97	-20.68
87–90	Colour	- 11.81 - 3.51 - 1.33 - 13.7 - 0.96 - 18.03	- 0.37 - 0.37 - 14.76 - 4.76 - 10.8 - 9.44
112–113	Tempo: Timing into new section.	+4.58 -19.78 -3.45 -5.97	-7.17 -17.93 5.81 -3.21
Bar	Brief description of SIF	P2 (% deviation	P1 (% deviation

		from mean tempo)	from mean tempo)
5–8	Tempo, dynamics, better ensemble	-2.25 +9.19 +3.05 +0.71 -0.24 +0.90 -2.61 -18.94	-0.12 +1.79 +1.98 -2.85 +1.98 -8.04 -1.59 -15.87
9	Tempo: More rubato in P2	- 10.63 - 6.38	- 12.87 + 16.99
10	Tempo: More rubato in P2	- 3.67 + 5.30	+ 6.23 + 0.9
11–12	Tempo: More rubato in P2	+ 0.9 - 17.94 - 11.96 - 19.68	- 2.85 - 7.53 - 14.52 - 10.87
17–18	Tone colour, Tempo	-14.67 +9.86 -9.48 +11.00	-3.74 -7.10 -12.60 -6.28
23–26	Tone colour, Tempo	-13.15 -3.08 +14.81 -11.86 -41.08 +5.31 +0.19 -11.42	-20.09 +23.34 +9.11 -0.49 -39.82 +1.80 -19.24 +6.06
52	Tempo: Rubato in first violin – others seem not to respond	+2.22 -6.23	+0.29 +6.47
109–113	Dynamics	-1.78 -14.25 -2.83 +1.31 +1.12 -4.69	-1.52 -4.61 -12.80 -0.43 -0.43 -3.97

		-9.43 -15.84 -5.68 +7.06	+4.58 -19.78 -3.45 -5.97
117– 121	Dynamics	-8.21 -1.96 +1.69 +2.64 -2.31 +6.85 +2.45 -26.17 +5.82 -5.68	-8.21 +0.50 +6.43 -5.31 +8.57 +3.58 -4.31 -19.42 -4.81 +4.17

Just as with the quartet's moments of perceived SIF, the independent observer's data also suggests that moments of perceived SIF for this quartet, playing this repertoire appear to be strongly linked to tempo variation. The tempo deviation percentages associated with the bars selected by the observer all have similar properties to those picked out by the quartet. However, even the moments which had been perceived as moments of SIF in only volume level or colour also included variation in tempo. Examples of this include bars 34–38, 111, and 119 in Table 6.3 above.

Bars 87–90 in P1 and bars 9–12 in P2 were both coded as instances of perceived SIF by two of the quartet players and by the external observer. There does not appear to be anything strikingly different about these bars in terms of tempo variation relative to the other bars coded by the external observer.

Table 6.8 shows the results for three selected moments that had not been coded as SIF by either the quartet members or the independent observer.

Table 6.8. Examples of non-SIF moments

Bar	P1 (% deviation from mean tempo)	R (% deviation from mean tempo)
29–32	-9.19 +0.48 +3.29 -7.24	+0.51 +5.04 -3.64 +0.51

	+1.87	+0.51
	+6.25	+0.51
	+5.39	+0.51
	+1.47	+9.54
91–94	+2.34	-0.56
	-5.09	+4.68
	+11.03	+12.81
	-6.28	+2.48
	+5.22	+2.48
	+7.83	+4.47
	-0.58	+7.61
	+3.55	-2.36
Bars	P2 (% deviation from mean tempo)	P1 (% deviation from mean tempo)
13–16	+16.81	+10.47
	+11.23	+3.18
	+2.49	+1.41
	+4.70	+9.56
	+5.94	+2.19
	-1.84	+3.58
	+3.68	+3.99
	-2.19	-2.32
63–66	+9.21	+18.58
	+7.21	-6.28
	-8.26	+0.76
	+5.92	+4.38
	+3.84	-0.39
	+2.62	+7.16
	+8.31	+8.27
	+3.23	-12.11

The results of the non-SIF moments in relation to tempo deviation between conditions are similar in places to moments of perceived SIF by both the performers and the independent observer. This suggests that it is possible for moments that have not been perceived as SIF to still involve deviations in tempo.

6.3.3.2 Volume

Since the rehearsal and performance venues were different spaces, the relative variability of sound level rather than the overall sound level of each excerpt was calculated using the *Mazurka Project's* "Smoothed Power" transformation in *Sonic Visualiser*. The *Mazurka Project's* "Dynamatic" program then computed the volume in decibels for each beat throughout each excerpt. These volume values were then input into *Excel* where the mean volume for each excerpt was computed. Individual volume scores could then be represented as percentage deviations from the mean volume for an excerpt. Graphs of relative volume against beat were plotted for each excerpt for each set of three conditions

Calculating the percentage deviation from the mean volume level at every beat for each condition was the best attempt at normalising the data, mitigating the effect of the different room sizes. Unfortunately, this does not necessarily mitigate the effect of the different venues on volume variation within each condition. The line representing the rehearsal condition (R) in each volume graph shows a slightly wider deviance from the mean than those representing the performances (see Figure 6.5 below).

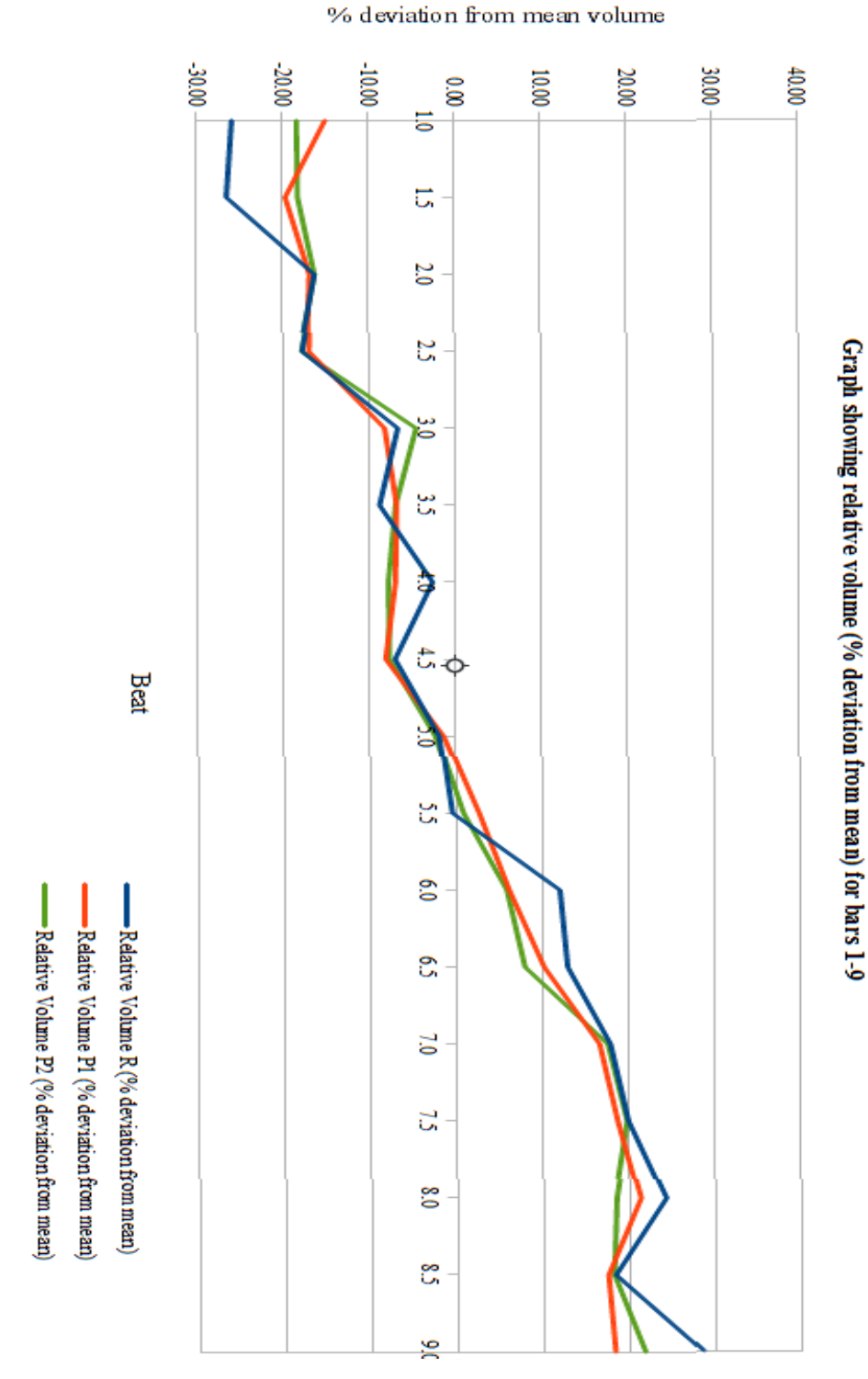

Figure 6.5. Graph showing relative volume (bars 1–9)

This is likely a result of the rehearsal room being much smaller and drier in acoustic than the performance venue, which was a large church hall. This can be seen most clearly in very quiet passages where the sound almost disappears, compared to similar passages played in the performance venue where the sound tended to linger. The lines representing the two performance conditions are slightly narrower, reflecting the bigger, more resonant space.

The bars relating to the instances of SIF perceived by the quartet musicians were identified in the volume analysis data and examined to determine whether any variations in volume could be found in those places. Five of the six moments of SIF perceived by the quartet corresponded with moments of variability in volume according to the acoustic data (see Table 6.9). Just as with the tempo data, since only single bars or time stamps had been logged by the quartet members, any variations in volume in subsequent beats were also included by the researcher.

Table 6.9. Table showing logged instances of SIF in relation to volume variation

Bar/Beat	Brief description of SIF from recall logs	P1 (% deviation from mean volume)	R (% deviation from mean volume)
23	Tempo: Violin 1 rubato, varied.	+2.87	-1.57
43	Tempo: More time taken in P1.	No variation found	
87	Dynamics: Cello bass-line.	-8.92	+0.96
Bar/Beat	Brief description of SIF from recall logs	P2 (% deviation from mean volume)	P1 (% deviation from mean volume)
9	Character: Violin 2 more restless, violin 1 reacts. Colour: Change in colour created, reflecting felt change in harmony.	+21.87	+18.37
38 38.5 39	Tempo: Violin 1 takes time over barline in P2.	-5.03 -3.5 -4.75	-3.92 -0.17 -1.84
81 81.5	Tempo: Cello starts the new section more slowly. Character: different upbeat affects the character of the new section.	-16 -2.05	-15.64 -6.31

As shown in the table above, variations in volume were less dramatic compared to variations in tempo at the points of SIF identified by the quartet. This supported the findings of the recall logs and interviews where instances of SIF coded were mainly related to tempo. For this quartet, playing this piece, and taking into account the effect of the different room sizes on the data, variation in volume level was not as reliable an indicator of moments of the quartet's perceived SIF as tempo variation was.

An instance of perceived SIF corresponding with a slight variation in volume as identified in the acoustic analysis is shown in Figure 6.6 below. This was the only example of perceived SIF logged by the participants that was described as being related to dynamics.

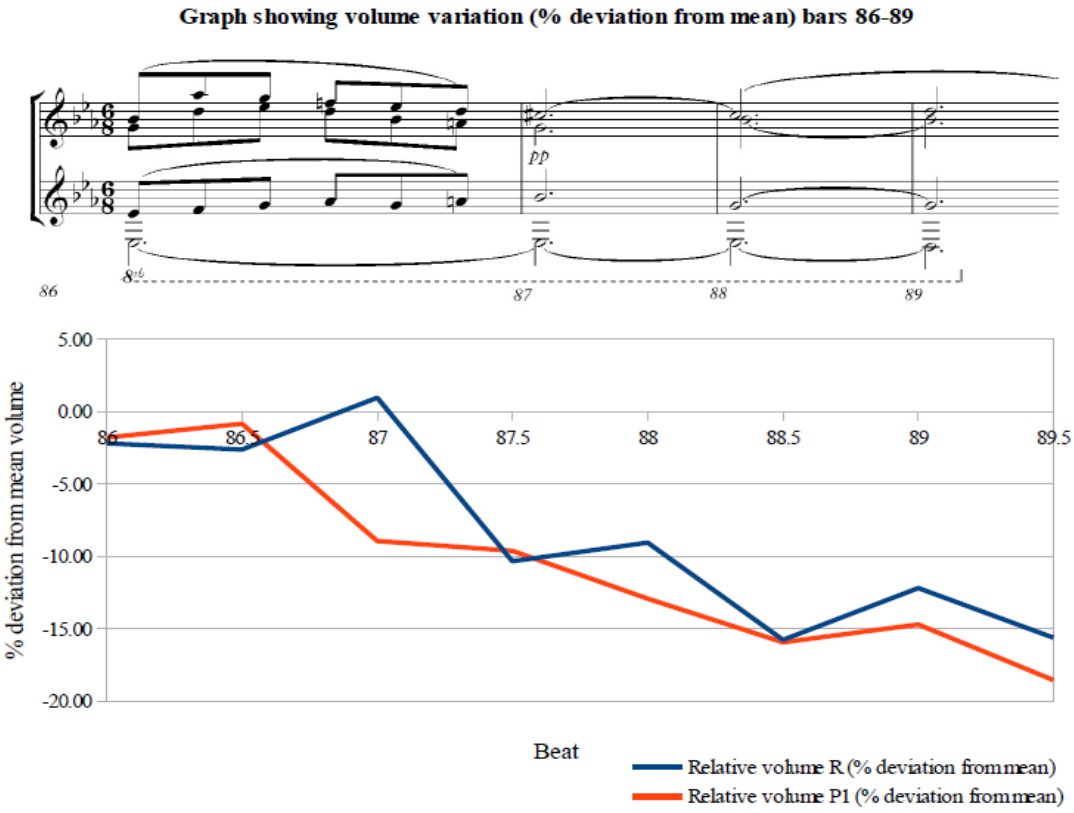

Figure 6.6. Graph showing relative volume for P1 and R for bars 86–89

The graph above shows a slight variation in volume between the rehearsal interpretation of these bars (R), and the first-time performance interpretation (P1). The main point of difference is beat one of bar 87, as shown in Table 6.9 above. In the rehearsal, this is relatively louder than the same beat in the performance. This could be because during the rehearsal the intention was to start the *pp* diminuendo chords a little louder to allow

for a greater diminuendo over the subsequent bars. In the performance they may have chosen to start it a little quieter, exaggerating the *pp* to make the dynamic change more obvious, compensating for the more resonant performance space. Aside from that beat, there is no great dynamic variation between the two conditions. A slight marking of the first beats of each of the chord bars in the rehearsal compared to the performance perhaps.

Figure 6.7 shows an example of a slight dynamic variation between the first and second time interpretation of the exposition during the performance. This was logged as a moment of SIF by the cellist, but her description of the moment of SIF did not include a perceived variation in dynamics.

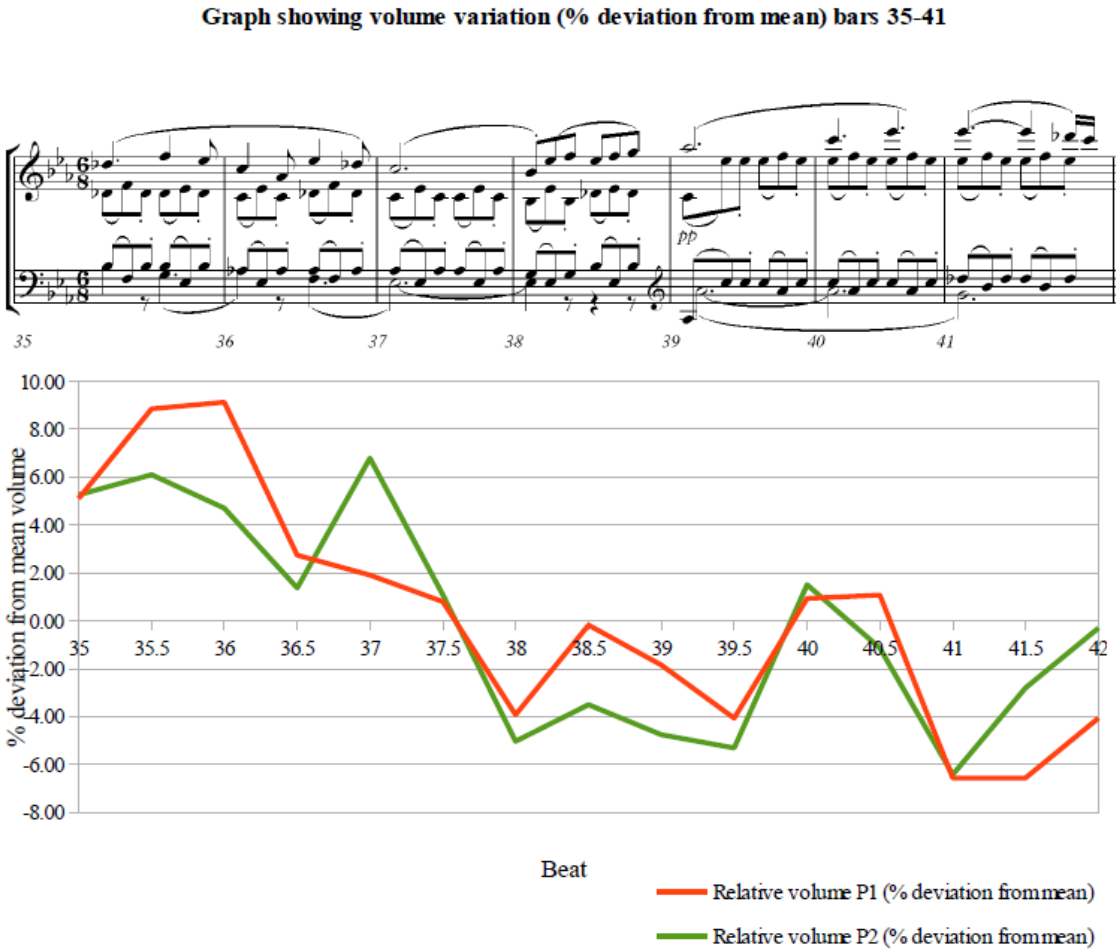

Figure 6.7. Graph showing relative volume for P2 and P1 for bars 35–41

The drop in dynamics to *pp* for the restatement of the second subject an octave higher (bar 39) is a little more exaggerated in P2 compared to P1. This creates a more *subito*

pp effect in P2, rather than the slightly more subtle drop in dynamics in P1. The exaggerated drop in dynamics would likely be instigated by the first violin who has the melody at that point. The other players would have identified the change in dynamic and responded by playing more softly to balance the parts. However, since this moment was not specifically described as SIF in terms of volume, this suggests that although the slight exaggeration in dynamics may add to the perceived SIF of the moment, the rubato was more dominant in the performer's perceptions.

Only one specific example of SIF described as relating to dynamics was logged by the quartet members (bar 87 – logged by the violist and cellist). This was also the greatest difference in volume variation between two conditions of any of the moments of perceived SIF reported in Table 6.3. During her interview the first violinist noted volume variation as one means of achieving a novel interpretation in performance. However, she explained that for it to be perceived as a true moment of SIF, by the players or by a listener, the difference in dynamics had to be truly exaggerated by the performers. It is possible that this view is reflected in the results here. The one example of a moment of SIF described as relating to dynamics has a much greater amount of volume variation between conditions than any of the other examples. This suggests that perhaps only large variations in volume are perceived by the players as being moments of SIF. In his analysis of different pianists' interpretations of the same Chopin prelude, Repp (1999) found that the dynamic profile was similar across many performances, suggesting a widely shared central norm of expressive dynamics. The results of the present study seem to support that finding.

Table 6.10 shows the moments of SIF logged by the independent observer in relation to volume variation as found in the acoustic analysis. Only Moments described specifically as relating to dynamics or changes in sound are included in the table. Examples with little variation have also been excluded, including the two instances of perceived SIF that were also logged by the quartet players.

Table 6.10. Table showing the independent observer's logged moments of perceived SIF in relation to relative volume data from the acoustic analysis

Bar/Beat	Brief description of SIF	P1 (% deviation from mean volume)	R (% deviation from mean volume)
34–38	Character: Different sound and character – cello. Colour: Different colour – violin	-1.70 -2.26 +5.10 +8.85 +9.13 +2.74 +1.91 +0.80 -3.92 -0.17	-3.65 -5.35 +7.58 +1.57 +3.27 -2.21 +2.62 +4.19 -2.60 +0.01
Bar/Beat	Brief description of SIF	P2 (% deviation from mean volume)	P1 (% deviation from mean volume)
17–18	Tone colour, Tempo	+0.02 +9.24 +2.12 -3.47	-5.06 +2.03 -0.33 -3.81
109–113	Dynamics	+7.34 +19.65 +14.67 +17.16 +6.47 +15.40 +0.90 +5.44 -13.6 -3.93	+8.20 +19.88 +14.04 +15.50 +2.36 +5.43 -2.75 +5.14 -13.56 -2.60
117–121	Dynamics	+5.88 +12.62 +12.91 +12.91 +5.44 +6.17 +0.17	+4.40 +9.66 +12.29 +12.29 +5.43 +9.52 +4.40

		+6.76 +4.56 +11.45	+7.33 +6.60 +14.04

Again, less variation in volume was detected compared to variation in tempo. However, unlike the quartet, the independent observer logged two specific instances of perceived SIF described as being related to dynamics. These two instances (bars 109–113, and bars 117–121) showed a greater variation of volume, shown as percentage deviation from mean, between conditions P1 and P2. Since these were the only logged instances of SIF relating to dynamics, this suggests that dynamic variation is likely to be a good general indication of SIF, although for this particular quartet and this repertoire, there was little dynamic variation between the recorded interpretations. Figure 6.8 shows the volume variation between P1 and P2 for bars 109–113.

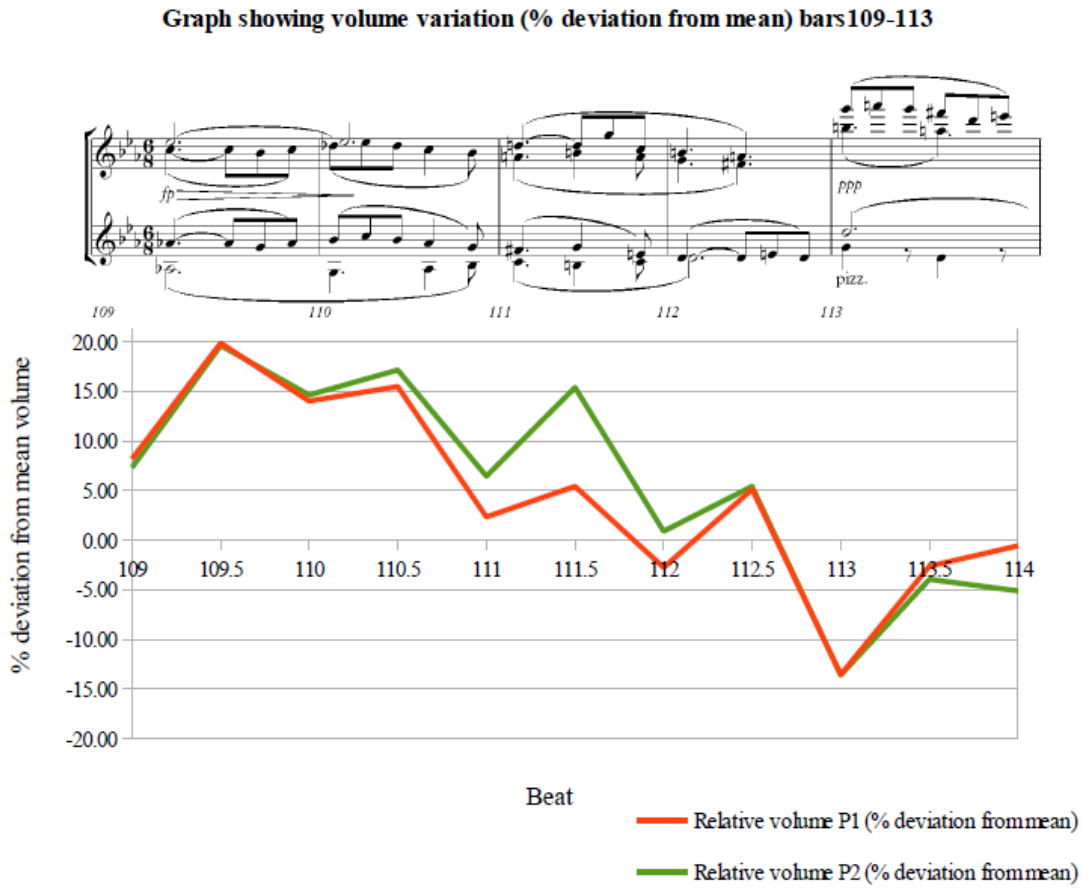

Figure 6.8. Graph showing relative volume for P2 and P1 for bars 109–113

The volume variation at the *fp* in bar 109, and moving into the *ppp* in bar 113 is almost identical for P1 and P2. The greatest difference in volume variation between P1 and P2 for these bars is in bar 111, where the quartet seem to make a stronger *crescendo* into the middle of the bar in P2 than in P1. This seems to support the independent observer's assertion that less *dimuendo* in the inner parts in P2, forced the first violinist prepare the colour change at 113 differently. In bar 113, the graph suggests that in P2 the theme starts at a similar relative dynamic to P1, but does not *crescendo* as far as in P1.

Just as with the quartet's logged instances of perceived SIF, there were examples of moments logged by the independent observer as being examples of SIF, but with no mention of dynamics, where the acoustic analysis did show volume variation.

Table 6.11 below shows the volume variation in the same four non-SIF examples selected earlier.

Table 6.11. Table showing moments of non-SIF in relation to volume variation

Bar/Beat	P1 (% deviation from mean volume)	R (% deviation from mean volume)
29–32	-1.28	-5.35
	+3.02	-0.12
	-2.12	-6.13
	+0.52	-3.00
	-0.87	-3.65
	+3.16	+1.97
	+4.55	+1.70
	-1.70	-2.34
91–94	-12.76	-15.46
	-12.90	-14.74
	-2.88	-6.60
	-5.49	-13.03
	-6.45	-8.18
	-4.25	-11.32
	-5.46	-12.32
	-2.74	-3.75
Bar/Beat	P2 (% deviation from mean volume)	P1 (% deviation from mean volume)
13–16	-7.90	-4.26
	-8.32	-3.98

	-4.39	-2.01
	-3.69	+4.31
	-1.16	+1.50
	+1.93	+3.61
	+3.33	+1.78
	+3.47	+3.75
63–66	-0.68	-2.20
	+2.19	-0.82
	+6.57	+6.58
	+8.62	+7.54
	+11.09	+12.76
	+1.78	+3.43
	-4.37	-3.98
	-4.65	-4.94

Aside from the second non-Sif example (bars 91–94), none of these non-SIF moments show any large deviations in volume between conditions. Figure 6.9 shows bars 63–66, comparing P2 to P1. The lines representing the percentage deviation from mean volume for each condition are close together, showing that there is not much difference in terms of volume deviation between the two conditions.

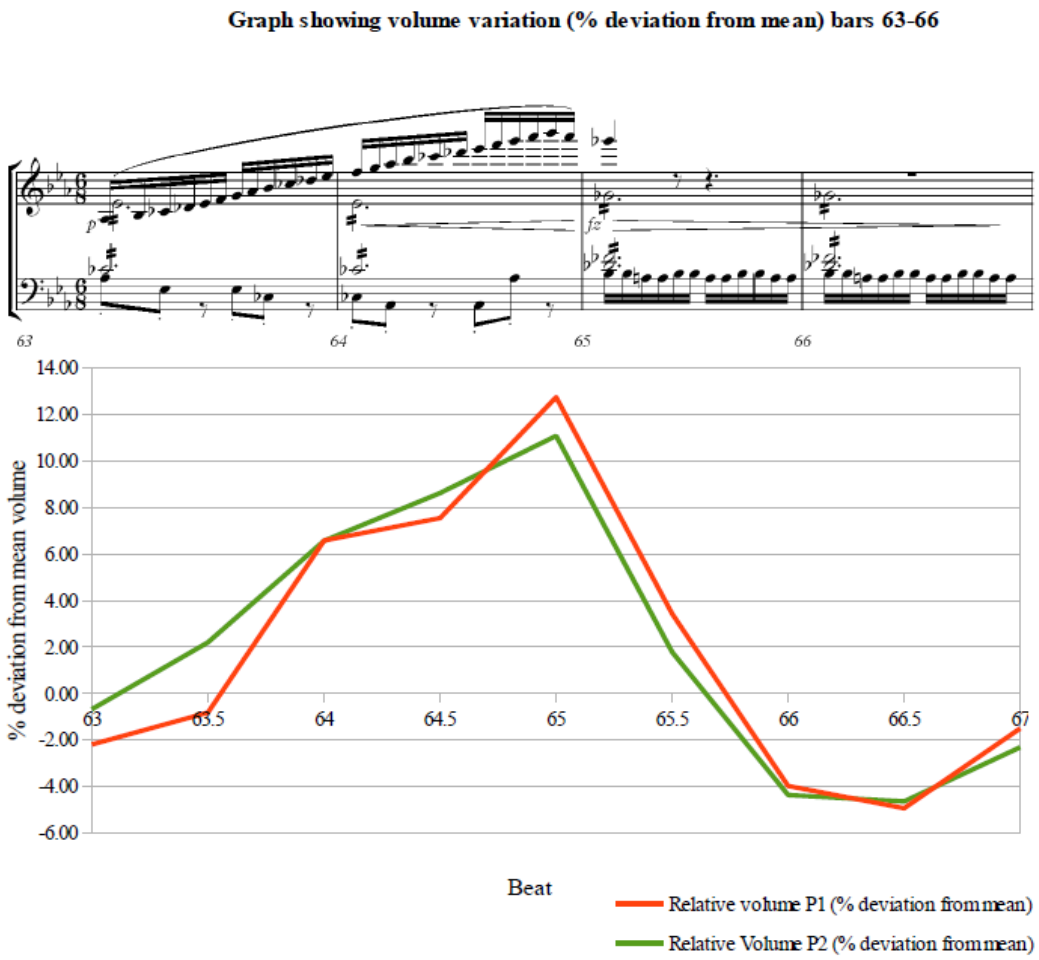

Figure 6.9. Graph showing relative volume at a non-SIF moment for P2 and P1 for bars 63–66

Bars 63–66 were not logged as a moment of SIF by either the quartet members, or the independent observer. The graph in Figure 9 shows little difference in relative volume for P2 compared to P1. The lack of difference between these two conditions for volume according to the acoustic analysis may partially account for these bars not being logged as a moment of perceived SIF by any of the participants.

Figure 6.10 shows bars 91–94, another example of a non-SIF moment in P1. However, there appears to be differences in volume between the two conditions on the second beat of bar 92, the second beat of 93, and the first beat of 94.

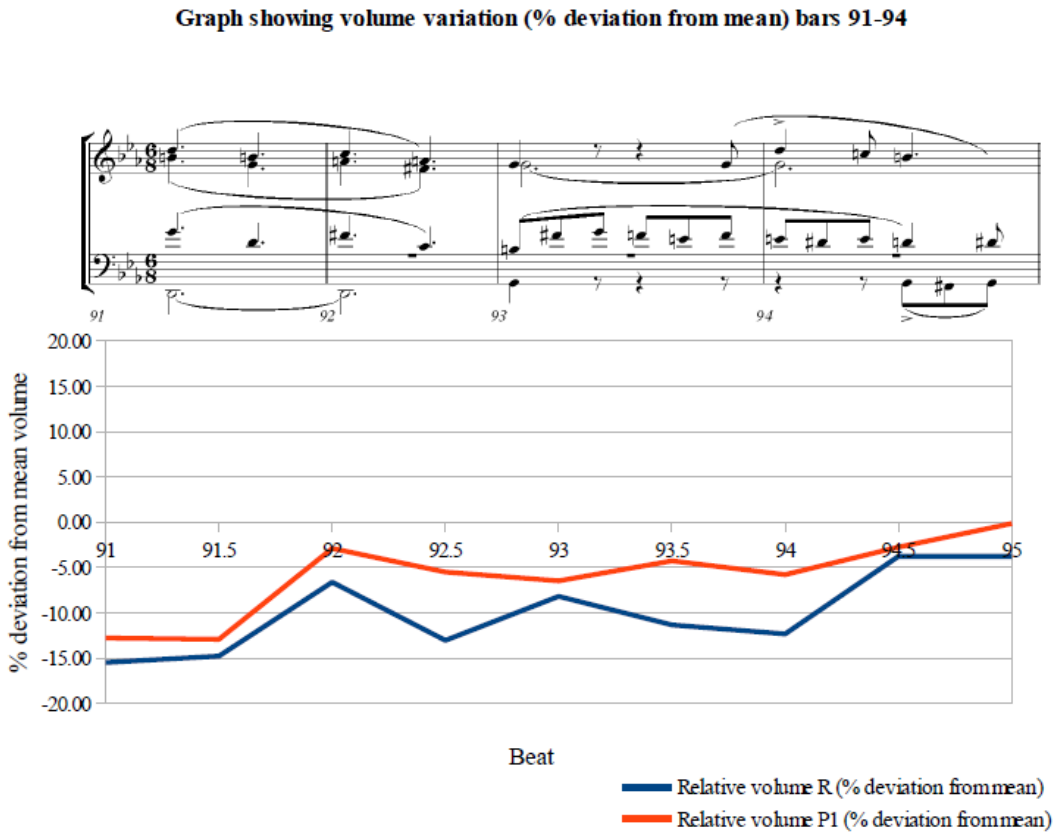

Figure 6.10. Graph showing relative volume at a non-SIF moment for P1 and R for bars 91–94

Just as with the analysis of the tempo deviations in non-SIF moments, this suggests that it is possible for moments where neither the players nor observers have perceived SIF to be occurring to still show variations in this expressive parameter.

6.4 CONCLUSION

This study sought to investigate SIF in expert ensemble performance by exploring the perceived instances of SIF identified by the performers themselves as well as those identified by an independent observer. In terms of the study's first research question (do co-performers perceive themselves to be experiencing SIF at the same time?), there were three examples of two of the four quartet members perceiving that they were experiencing SIF at the same time during the performance of the exposition section of the *Quartettsatz*. The other three examples of perceived SIF were coded separately by individual players. This suggests that not all members of the same ensemble perceive

their ensemble to be achieving SIF at the same time. When players did agree that they were experiencing SIF at the same moment, it is possible that these moments were stronger examples of SIF. However, there appeared to be no difference for either tempo or volume variation according to the acoustic analyses for the three examples logged by two players, compared to the three examples logged by only one player.

The second research question concerned whether the same moments of SIF were perceived by the performers and an independent observer. Only six instances of SIF were identified by the quartet, but 11 more were identified by the expert independent observer. That the quartet perceived fewer instances of SIF than the independent observer in their performance could be because, as the first violinist suggested in her interview, they tended to rehearse a few different interpretations during the rehearsal process before settling on what they felt was the optimum interpretation during those final rehearsals recorded here. Moments when they reverted to a previous interpretation during the performance might, therefore, not be regarded as flexible by the quartet members despite being flexible when compared to the recording of their final rehearsal where a final interpretation was agreed. Unlike the independent observer, the quartet members had access to their entire shared history of rehearsing and performing this piece together. This could have resulted in the quartet members not identifying moments where they were being flexible according to the strict theoretical sense applicable to the design of this study, since the independent observer and the acoustic analysis compared P1 to R, and P2 to P1. This also highlights the complexity of the notion of SIF in ensemble performance, as a multi-layered process through which players explore and develop interpretations of a piece together over a period of time in rehearsals.

Interestingly, although the expert independent observer identified many moments of perceived SIF, only two of these moments were common with those identified by the quartet members. The two moments logged by both the independent observer and the quartet showed variation in tempo, but not in volume according to the acoustic analyses. The greater number of moments of perceived SIF identified by the independent observer could be attributed to the design of the study. Since the quartet players were determining moments of SIF based on their knowledge of their rehearsed interpretation of the repertoire, they would likely have approached the task differently to the independent observer. In addition, the observer had access to the audio from the rehearsal interpretation to be able to draw more direct, objective comparisons between the quartet's established interpretation of the repertoire, and their performance

interpretation. This difference in approach, limited by the design of the study, could account for the contrast in the number of incidences of perceived SIF between the players themselves and the independent observer.

The third and fourth research questions sought to identify acoustic characteristics of moments of perceived SIF logged by the performers and by the independent observer. The most striking acoustic feature of the moments of SIF identified by the quartet players was tempo variation. This supported the players' descriptions of their logged moments of SIF since most were moments of perceived rubato or tempo variation. According to the findings of the acoustic analysis, there was also evidence of some volume variation in the moments of SIF identified by the quartet, although the volume variation tended to be less striking than the tempo variation. Similarly, the most striking acoustic characteristic of the moments of SIF identified by the independent observer was also tempo variation, although there were some strong examples of volume variation in his moments of perceived SIF. The external observer's descriptions of his perceived instances of SIF were more varied than those of the quartet, and encompassed variations in tempo, volume, colour and sound.

As a point of comparison, four moments which had not been coded as perceived moments of SIF by either the performers or the independent observer were also analysed for tempo and volume variation. It was found that there were some similarities between these non-SIF moments and moments that had been coded as SIF by the performers and independent observer in terms of tempo variation, and just as with the performers' perceived moments of SIF, no real variations in volume were detected in these non-SIF moments. It is unclear why some of these non-SIF moments held similar acoustic properties to those coded as instances of SIF without being perceived as instances of SIF. However, it is possible that this is due to observer perception. Perhaps perception of instances of SIF is informed by performers' visual cues and gestures as well as by auditory information in the form of tempo and volume deviations. Many studies have examined performers' use of gesture in relation to expressivity in performance (e.g. Davidson 1993, 1994, 1995; King & Ginsborg, 2011).

This study featured a conventional classical ensemble, performing a piece of romantic string quartet repertoire. The nature of the ensemble and the repertoire offered a lot of potential for expressive variation, although the second violinist and violist did not completely agree with this view in their interviews. However, despite their perceptions of the piece as being largely a solo for the first violinist which did not allow

for much SIF for the other parts, they were both able to identify moments during the performance when they felt they were being flexible, and their interview responses described SIF as a group process. During their individual recall interviews, the quartet members described how they as an ensemble approached this repertoire with the intention to "keep it fresh" in the performance by producing moments of SIF. This shared intention is an example of the ensemble's shared approach to the music. All of the quartet members agreed that SIF was an important group process for expert ensemble performance and that it was something they strived for themselves. This supported the findings of the focus group study, as well as those of existing studies (e.g. Davidson, 1997; Seddon, 2005; Seddon & Biasutti, 2009). The focus group study also found SIF to be a feature of ensemble players' optimal performing experiences. If this is the case, then since SIF is a case of intense co-performer empathy, co-performer empathy must also be an important and desirable process for expert ensemble playing.

The main limitation of this study was that it was possible to measure only two expressive parameters – tempo and volume variation – in the acoustic analyses. This was mainly for practical reasons. More in-depth analyses exploring individual players' vibrato, for example, might add some interesting data. However, this would necessitate the use of individual point microphones and so would be impractical in a live performance in front of an audience. Other studies have already examined dimensions of expressive performance in music in great depth, and models have been built (e.g. Juslin, Friberg, & Bresin, 2002). The purpose of this study was to examine SIF as a case of intense co-performer empathy, and so these additional dimensions were not considered essential. The purpose of the acoustic analyses was simply to add an extra, more objective, point of comparison to consider in interpreting the quartet players' and the independent observer's logged moments of SIF.

It should be noted that, although the design of this study necessarily reduced the definition of SIF for the acoustic analyses and the independent observer's coding to comparisons between P1 and R, and P2 and P1, the complexity of the production of novel variations in ensemble performance is recognised. The idea expressed by the quartet's leader that the process of SIF can involve the rehearsal of several different interpretations of the same section of music in order to build in a certain flexibility in readiness for performance is but one example of an aspect of SIF not directly addressed in the design of this study. However, it seems likely that co-performer empathy would still contribute to the production of SIF in performance in that process, because

performers would still have to be intentionally aware of what other players were doing at any point during the performance in order to respond to whichever interpretation was chosen in the moment.

The results of this study support previous findings that SIF is both an important and a desirable aspect of expert ensemble performance. Since SIF is a case of intense co-performer empathy, this indicates that research into strategies for improving and developing co-performer empathy in ensemble playing is necessary. In order to build on the present study, further research into indicators and predictors of co-performer empathy was indicated. The next study was planned with this in mind, and examined heart-rate as an indicator or co-performer empathy.

CHAPTER 7. STUDY 4: OBSERVATIONAL CASE STUDY AND PHYSIOLOGICAL MEASURES WITH A VIOLIN DUO

7.1 INTRODUCTION

The results of the analysis of the quartet players' recall logs and interviews in Study 2 permitted the construction of a model of the process of co-performer empathy which was found to be based on a prerequisite condition of a shared approach to the music and to working together. It was often characterised by a special connection between players, and involved a cyclical process of empathic responding where players identified the expressive actions of their colleagues through an intentional awareness, and responded in a novel or pre-planned manner (Figure 7.1). Parallels were drawn between the process of co-performer empathy and the process of empathy more broadly, since both processes involve identification and response.

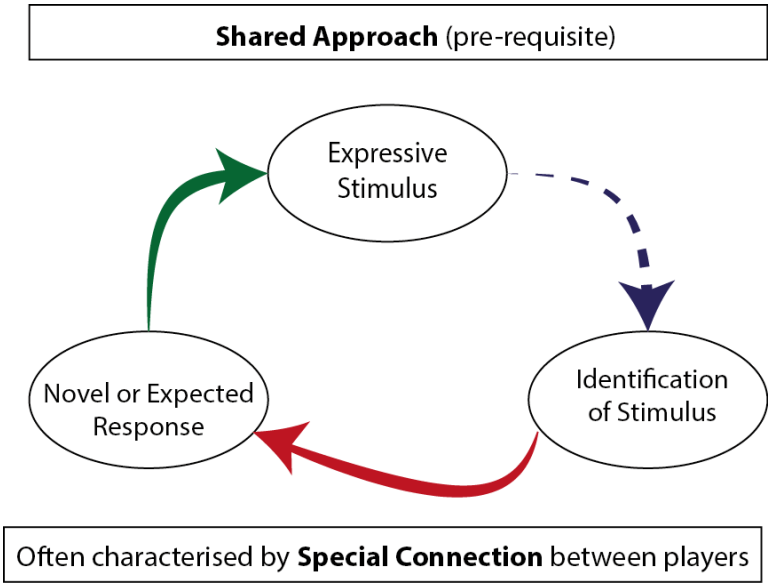

Figure 7.1. The process of co-performer empathy

SIF was found to be closely related to co-performer empathy and was revealed to be a case of intense co-performer empathy, since it involves a similar process of identifying and responding, but a greater intentional awareness. In the three previous studies, the process of co-performer empathy and the related process of SIF, a case of intense co-

performer empathy, have been investigated and identified through focus group interviews, acoustic analysis, and video-recall observations. However, self-report measures can have low reliability (Chlopin, McCain, Carbonell, & Hagan, 1988), and low validity for measuring empathy (Eisenberg and Lennon, 1983; Levenson & Ruef, 1992). They are limited by human perception errors, and affected by social desirability (Duan & Hill, 1996). An example of social desirability affecting self-reported empathy is given in a study in which delinquent participants reported higher empathy (cognitive concern) than non-delinquent control participants (Kämpfe et al., 2009). This difference was partially accounted for by the higher social desirability in the delinquent participants. Using an indirect measure, it was found that empathy was, in fact, higher in the non-delinquent participants than in the delinquent participants. The findings of this study underline the importance of exercising caution when relying solely upon self-report measures of empathy (Neumann & Westbury, 2011). This indicates that there could be scope to explore empathy using a multi-method approach, combining self-report measures with physiological measures. The fourth study in this thesis thus seeks to investigate the behaviours and experiences associated with empathy in ensemble performance using such an approach.

7.1.1 Empathy and Physiological Measures

There have been two studies of significance employing heart-rate as a physiological measure for empathy, both of which lie outside the field of music. Krebs (1975) examined skin conductance, heart-rate, and blood pulse volume in participants observing a target play a game of roulette. Participants were split into two groups. The first group were told that the target would win money of experience pain according to wins and losses in the game. The second group were told that the target was merely completing a cognitive task. The first group of participants showed larger physiological reactions than the second group of participants. In addition, the physiological responses were greater in participants who believed they were similar to the target. The researcher concluded that participants empathised with the target when he experienced pleasure or pain. It was found that heart-rate deceleration was associated with participants' experience of empathy.

In a later study, Levenson and Ruef (1992) measured participants' heart-rate, skin conductance level, general somatic activity, and pulse, to examine accuracy of

empathic response. Participants viewed a video of interactions between two spouses and continuously rated the perceived affect of a designated spouse. Affect ratings and physiological data had previously been collected from the spouses in the video. How closely an observer's physiological responses and affect ratings mirrored the target spouse's were examined as a measurement of empathic response. In terms of heart-rate response, participants who were best able to rate the positive affects experienced by another individual displayed lower cardiovascular arousal. The results of the analysis also revealed that accurate rating by an observer of a target individual's negative emotions was associated with a state of shared physiology in which observer and target evidenced similar patterns of autonomic response over time.

In more recent work, researchers have examined empathy from the perspectives of emotional contagion, mimicry, and mirror neurons. In addition to skin conductance, heart-rate, and blood pulse volume, more recent studies have begun to use neural imaging and EEGs. Results of these studies have shown these neurological measures to be correlated with self-report measures of empathy (Hooker et al., 2010; Shamay-Tsoory et al., 2005; Sonnby-Borgström, 2002; Sterzer et al., 2007; Westbury & Neumann, 2008).

There are related physiological studies within the field of music examining musicians' responses to performing in high- and low-stress situations (e.g. Facchini, Harper, La, & Ricca, 2013; Williamon et al., 2013), and researchers have begun to examine performing musicians' heart-rates across various phenomena. One study has investigated the relationship between solo pianists' self-reported moments of flow during performance, and their recorded physiological measures, including heart-rate (de Manzano et al., 2010). Each pianist performed the same piece of music five times whilst their heart-rate, pulse pressure, respiration, blood pressure, head movements, and facial muscle movements were measured. Results found that the EMG, cardiovascular, and respiratory measures were all significantly associated with self-reported flow.

7.1.2 Music, Empathy and Heart-Rate

In the field of music, only one study has so far examined empathy in relation to physiological measures. Miu and Balteş (2012) investigated listeners' empathy with a performer in music of different affect and style. The main aim of this study was to test the causal relationship between cognitive empathy and music-induced emotions.

Cognitive empathy was manipulated during music listening whilst music-induced emotions and physiological activity (ECG, galvanic skin response, and respiration) were measured continuously. There were two empathy conditions: low empathy and high empathy. For the high empathy condition, participants were instructed to empathise as closely as possible with the performer. For the low empathy condition, participants were asked to remain as detached as possible. The general hypothesis was that, in comparison to the low empathy condition, the high empathy condition would increase music-induced emotions and physiological activity. Considering that multimodal displays of music that incorporate facial expressions, gestures and body postures as well as sounds may facilitate empathy with the performer, video recordings of the two music pieces performed in concerts were used. The high empathy condition was associated with significantly lower galvanic skin response and significantly higher respiration rate than the low empathy condition. No effect of the empathy manipulation was reported in relation to heart-rate.

Despite no significant relationship being reported in Miu and Balteş' (2013) study between heart-rate and empathy with the performer, the decision was taken to investigate the relationship between empathy and heart-rate for expert ensemble musicians in this study. Miu and Balteş were investigating an external observer's ability to cognitively empathise with a video-recorded performer, and required the participants to manipulate their own empathy artificially. Although they did not report any significant relationship between empathy and heart-rate, other studies have suggested a connection between empathy and heart-rate in other, extra-musical contexts as discussed above (Krebs 1975; Levenson & Ruef, 1992). In addition, other empirical studies of music performance have begun to incorporate heart-rate measures as physiological indicators for experience of flow and performance anxiety, with significant findings (e.g. de Manzano et al., 2010; Williamon et al., 2013). Since the present study involves performing musicians rather than listeners, it was considered that heart-rate in combination with self-report measures may yield some interesting results.

7.1.3 Empathy and Heart-Rate Study

7.1.3.1 Aims

This study was intended to be a preliminary exploratory case study to test a multi-method approach for investigating the relation between co-performer empathy in

ensemble playing and physiological response – heart-rate. There were two aims for this study:

1. To examine co-performer empathy in ensemble performance in relation to heart-rate.
2. To find further evidence in support of the process of co-performer empathy and its relationship to SIF, as identified in Study 2.

7.1.3.2 Hypothesis

Heart-rate acceleration is associated with heightened arousal when arousal occurs over a period of time, but heart-rate deceleration is associated with attentiveness during the immediate intake of information (Craig, 1968; Krebs, 1975; Levenson & Ruef, 1992). The process of co-performer empathy involves an intentional awareness to identify a co-performer's intentions followed by a novel or pre-planned response. It was, therefore, predicted that moments of self-reported empathy during ensemble playing would be associated with low cardiovascular arousal, as in existing studies of empathy and heart-rate.

7.1.3.3 Research Question

Is there an association between ensemble musicians' heart-rates during performance, and their self-reported experiences of co-performer empathy?

7.1.3.4 Study Design

This study used a repeated measures design with three performance conditions as the independent variable: Violin A leading, Violin B leading, and no designated leader. The two dependent variables were heart-rate and co-performer empathy. In order to control for the effect of the two musicians playing different parts in the duet ensemble on the heart-rate data, the players were asked to perform the same piece of music in unison. Bach's "B minor Double" from *Partita No. 1* was selected for performance because of its continuous quavers (see Appendix V), in order to minimise the effect of varied amounts of physical exertion on the participants' heart-rates over time. Both repeats were performed. Solo Bach in particular is interpreted in different ways by different violinists and is part of the mainstream violin repertoire. Both of the expert violinists in the study had played the piece before, albeit several years ago. It was considered that

their anticipated different interpretations of the piece would lend further interest to the study in terms of flexibility and response.

7.2 METHOD

The method was first piloted on two undergraduate violin students at a UK university music department. The students were not expert violinists and did not play together regularly. The purpose of the pilot study was to test the methods of data collection and data synchronisation. The method was slightly adjusted following the pilot study to incorporate a 20-minute resting period before the rehearsal and performance conditions, in order to establish a value for each participant's resting heart-rate.

Data collection for the main study was conducted as detailed below. One of the violinists was unwell during the main study and this affected the heart-rate data. For this reason, the study was re-run on a second occasion one month later to acquire a complete set of new data when both participants declared themselves to be in good health. These data are reported below.

7.2.1 Participants

The participants were two professional violinists (one male and one female, both aged 26 years). Both were graduates of a postgraduate performance programme at a UK conservatoire, and had played together regularly as part of an established, professional string quartet for more than four years. The quartet has a busy international concert diary, and has won two prestigious competitions. The female violinist (Violin A) is the quartet's violist, and the male violinist (Violin B) is the quartet's leader. Violin A was a principal study violinist and performs with professional orchestras as a violinist on a regular basis. The participants used to play together regularly as a violin duo as well.

7.2.2 Materials

A *Sony* video-recorder, two *Zoom* recorders, two *Polar RS800CX* heart-rate monitors, supporting *Polar* software, and the "B minor Double" from Bach's *Partita No. 1* for solo violin (see Appendix III).

7.2.3 Procedure

The participants were each sent a copy of the solo Bach piece to prepare a week in advance of the recording session. The study's aims and procedure were explained fully to both participants and written consent was obtained at the start of the recording session. Participants were set up with the heart-rate transmitters (chest straps) and the monitoring watches were kept by the researcher. Participants were instructed to lie down for 20 minutes to establish a value for their resting heart-rates. They were then given a warm-up period of 15 minutes to become comfortable with the recording equipment, to play through each performance task once, and to allow any technical adjustments to be made. Following the warm-up period, the video- and audio-recording equipment was switched on, and five minutes of silent sitting time were recorded before the first performance task. A similar five-minute period was recorded between tasks to allow the participants' heart-rates to lower again. Audio, video, and heart-rate data were recorded for both participants during three performance conditions:

7.2.3.1 Performance Condition 1: Violin A leading

The participants performed the Bach in unison, with Violin A instructed to lead a musically expressive performance, and Violin B to synchronise, as closely as possible in terms of ensemble, dynamics, tone, phrasing, intonation, and tempo. Violin A was told she could adjust her expressive or interpretative intentions if she discerned that Violin B was not adapting to an idea or direction. This meant there was also some scope for Violin A to be aware of Violin B's actions and to respond to his playing despite being the designated leader.

7.2.3.2 Performance Condition 2: Violin B leading

The participants performed the Bach in unison, with Violin B instructed to lead a musically expressive performance, and Violin A to synchronise as closely as possible in terms of ensemble, dynamics, tone, phrasing, intonation, and tempo. Violin B was told he could adjust his expressive or interpretative intentions if he discerned that Violin A was not adapting to an idea or direction. This meant there was also some scope for Violin B to be aware of Violin A's actions and to respond to her playing despite being the designated leader.

7.2.3.3 Performance Condition 3: No designated leader

The participants performed the Bach in unison with no designated leader, and were instructed to give a musically expressive, well-synchronised performance. Since neither participant was appointed the leader for this performance condition, both players had to be equally aware of the other's actions and ready to respond.

The participants were also asked to complete the Empathy Quotient scale (EQ; Baron-Cohen & Wheelwright, 2004) after data collection.

The participants were then given a project pack containing an instruction sheet, DVD recording of the three performance tasks, and a video-recall log sheet to be completed (see Appendix VI). They were asked to view the performance recordings and identify moments when they felt they were experiencing:

1. *Intentional Awareness* (IA): identifying the musical and expressive actions or intentions of their co-performer.
2. *Response* (R): responding in an expected manner to the musical and expressive actions or intentions of their co-performer.
3. *Special Connection* (SC): feeling a special connection with their co-performers, often described as being "in the zone" together.
4. *Flexibility* (F): responding in a novel manner to the musical and expressive actions or intentions of their co-performer.

The model of co-performer empathy constructed from study 2 involved the components intentional awareness and special connection, originally identified in the focus group study and confirmed in study 2. Response and flexibility were also included in the recall coding here to address the novel (flexibility) or expected (response) response, as identified in the model constructed in study 2. The recall logs were completed and returned to the researcher within two weeks of the recording session. The participants were then interviewed briefly by the principal investigator to discuss their responses with reference to the video data and the recall logs, and to reflect on their overall experience and ask any questions (see Appendix II for interview guide).

7.2.4 Analysis

The participants' recall interviews were transcribed and interpreted alongside their recall

logs. The model for the process of co-performer empathy and SIF in ensemble playing constructed from the findings reported in Study 2 was then re-evaluated in light of the present findings.

The heart-rate data were transferred from the heart-rate monitors to a computer, and the *Polar* software was used to convert the data into bpm. The time and bpm scores for both participants were then transferred into an *Excel* spreadsheet. The heart-rate data were synced with the video data, and divided into the three performance conditions. The heart-rate data were then explored in relation to the participants' recall logs.

7.3 RESULTS AND DISCUSSION

The findings of the recall logs, interviews, and their interpretation in relation to the process of co-performer empathy will be outlined first (sections 7.3.1 and 7.3.2), then the results of the heart-rate and EQ analysis will be presented afterwards (sections 7.3.4 and 7.3.5) prior to triangulation of the data set (7.3.6).

7.3.1 Recall Logs: Coding Frequencies

7.3.1.1 Coding Frequencies for Performance Condition 1: Violin A Leading

Violin A coded 11 moments of self-reported empathy during performance condition 1. Of these 11 moments, nine involved IA in combination with F. The two examples that did not involve IA, were coded as SC either by itself or in combination with F. In contrast, Violin B coded 38 moments of self-reported empathy during performance condition 1. Almost all of Violin B's empathy moments for performance condition 1 were coded as IA followed by F. During his recall interview, Violin B explained that he understood F to be automatically a type of R. No moments of SC were coded by Violin B. Table 7.1 below shows the coding frequencies for both players for performance condition 1.

Table 7.1. Coding frequencies for both players for performance condition 1

Codes	**Frequency Violin A**	**Frequency Violin B**
IA + F	3	36
IA + F + SC	4	0
IA + R	2	2

SC + F	1	0
SC	1	0
Total number of moments	11	38

Both players were least comfortable with performance condition 1 of all three conditions, since it required them to take on less familiar leader and follower roles to those they usually embody during their quartet work. Violin B explained that he had to make an extra effort to intentionally follow as closely as possible what Violin A was doing throughout performance condition 1, since he was used to being the leader in the quartet.

> I looked up a lot in the first task. What I usually do when playing first – it's a bad habit – I don't look up. I use peripheral vision more than I ought to.... So in the test when [Violin A's] leading we have I don't know.... I'm watching her face, her posture, specifically whether she's leaning forward into the music. Is she backing away? Is she arching her back? Is she sitting up straight? Is she hunching a bit? And the face can tell you a lot. (Violin B)

The high level of concentration exerted by Violin B, could explain the high frequency of his coding of IA + F for this condition. The two moments of IA + R that he recorded were examples of a rehearsed bow-stroke that he and Violin A had agreed upon in their 15-minute rehearsal period.

7.3.1.2 Coding Frequencies for Performance Condition 2: Violin B Leading

Violin A only coded three moments of empathy during performance condition 2. Violin B coded in a similar way to condition 1. All but one of his self-reported moments of empathy were IA + F.

Table 7.2. Coding frequencies for both players for performance condition 2

Codes	**Frequency Violin A**	**Frequency Violin B**
IA + F	1	22
IA + R	1	1
SC	1	0

Total number of moments	3	23

Both players agreed that performance condition 2 was more comfortable than the previous condition. Violin B was leading, as he was used to doing when they played together in the quartet. During her recall interview Violin A explained that whilst she was continuously aware of what Violin B was doing musically, the awareness was for the most part instinctive rather than intentional, and so she found it difficult to code moments of co-performer empathy during performance condition 2.

> It's very instinctive, because I'm not trying to follow and I'm not responding to anything particular, because I'm just allowing myself to kind of do what he does. And so, I felt that, I found that that was why I couldn't really say anything about the second one. Because I was just so passive, I just.... It's just that feeling of having someone's body in your periphery and just doing it as well, and it's nice. It's really nice to just give up the responsibility.... I couldn't tell you what [Violin B] does with his body to make things clear and if I thought about it, if I went "Oh, oh he's doing this. What does that mean?," it would have happened. Maybe it's because I've got quite slow reaction time. When I did a dyslexia test I'm in the bottom 30% for reaction time, which, as a chamber musician, is a disaster. So that's probably why I have to be more instinctive. (Violin A)

In his interview, Violin B noted independently that he felt Violin A was a much more instinctive chamber musician than he was in terms of following. Violin A's instinctive approach to following, possibly developed further than Violin B's because of her role within their quartet as an inner player, or as a response to a disadvantage in reaction time, could account for her low frequency of coding for performance condition 2.

7.3.1.3 Coding Frequences for Performance Condition 3: No Designated Leader

Violin A coded five moments of IA in combination with other codes, and five moments of SC either by itself or in combination with F. Violin B recorded ten moments of IA + F, and two moments of IA + R.

Table 7.3. Coding frequencies for both players for performance condition 3

Codes	**Frequency Violin A**	**Frequency Violin B**
IA + F	0	10
IA + R	2	2
IA + SC + F	3	0
SC + F	1	0
SC	4	0
Total number of moments	10	12

Again, Violin B's two moments of IA + R were at the same bars where the violinists had rehearsed and agreed on a particular bow stroke. He explained that he was unable to code as many moments of empathy since the third performance condition was much less "black and white" than the other two. For the first two conditions there was a designated leader which made the players' roles very clear in terms of leading and following. However, for the third performance condition, there was no designated leader which resulted in what Violin B described as "moments of grey." These moments of grey sometimes resulted in what Violin A coded as moments of SC. She explained that she coded more moments of SC during performance condition 3 than in either of the other two conditions because there was no designated leader. She felt there was more scope for moments of what she termed "shared understanding," where they had not planned on doing a certain thing, but simultaneously, instinctively made the same decision in the moment.

Violin A also reflected that, to an extent, she felt both players fell into their natural roles as quartet players during this third performance condition:

> [The third task] felt natural. But I think it was still mostly me being more flexible just because that's the way of it, which is what we're better at, and what we do most of the time. But then it was good, me kind of occasionally taking charge. (Violin A)

It is possible that the familiar working style which the participants settled into during this performance condition allowed them to relax and resulted in more moments of SC.

7.3.2 Recall Interviews: The Process of Co-performer Empathy

Thematic analysis of the recall interviews revealed two main themes in addition to the recall codes (IA, SC, R, F): familiarity and trust. Both of these themes had been identified previously in the focus group study reported in Study 1.

7.3.2.1 Familiarity: Established Dynamics

There were four different aspects to familiarity: established dynamics, musical tendencies, gestural idiosyncrasies, and mechanics of the instrument. Established dynamics referred to the usual roles which the participants embody in their quartet. As the leader of the quartet, Violin B was most comfortable when leading rather than following. Violin A notes that she was less comfortable leading, and suggests that this was evident for both players in performance condition 1.

> When I listened to it, there was much more shape in the second one. And it wasn't just because [Violin B] was showing more shape, it was because I could follow his shape, and he could show it. Whereas, I felt I was doing a lot of shape, but it was not being, you know, because I wasn't showing it as well as he wasn't following it. Not just that he wasn't following it as well. (Violin A)

As outlined in the previous section, this established dynamic between the two players seemed to influence their approach to the third performance condition, where no leader was appointed. This was an unavoidable consequence of the study design since it was important that the two violinists recruited were both members of an established chamber ensemble who played together regularly. However, whether they were more comfortable leading or following, moments of empathy were reported in both performance condition 1 and performance condition 3, the conditions in which the players were not in their usual roles. When they were leading both participants noted moments where they were aware of how well the other player was responding to their musical decisions. Examples were given in the recall logs of moments when the other player was following well and the leader felt able to do a more extreme version of their original intention, as well as examples where the player following had not caught on, and the leader was forced to abandon their intention. The established dynamic between the two players does not

seem to have affected the data collection directly.

7.3.2.2 Familiarity: Musical Tendencies

Violin B explained that his familiarity with Violin A's musical tendencies from all the time they spend rehearsing and performing together as members of the same quartet helped him to anticipate how she might approach or respond to particular moments in the music.

> Knowing their tendencies musically. And knowing the sort of repertoire of sounds that they are likely to make, that they like to make. Their tendencies.... How you anticipate that they will respond to what you do. And obviously if you work with them a bunch, like [Violin A] and I do, you can expect that they'll latch on really quickly to particular things. (Violin B)

Violin B felt that his familiarity with Violin A's musical tendencies allowed him to accurately identify her musical intentions in each phrase in time to be able to respond flexibly when he was following, and to be able to gage her likely response to his musical and expressive intentions in good time when he was leading. Violin A commented that their shared history of quartet playing allowed them to draw on ideas developed in quartet rehearsals, sometimes a particular sound or colour, or in one example a type of musical moment:

> I guess when, either when I kind of drew on our experiences to kind of predict what was going to happen and sensed him doing the same thing. The "Kung Fu Panda" thing, for example, that's a gesture we've talked about and I just could sense it. It came up, and we both applied it. (Violin A)

She went on to explain that a "Kung Fu Panda moment" had once been described to them in a quartet coaching by an eminent cellist, as a way of expressing a certain way of building up and subsequently releasing energy in a passage as an ensemble. She had coded a moment of this in her recall log and, whilst watching the same excerpt during her interview, she explained how she had felt a special connection with Violin B at that

particular moment. They had both simultaneously decided to create that particular musical moment that they had worked on building in other repertoire during quartet rehearsals, during a certain passage of the Bach without prior agreement. Their familiarity with one another's musical tendencies and shared history of working together allowed them, in this moment, to create something spontaneously and simultaneously without discussion.

7.3.2.3 Familiarity: Gestural Repertoire

Another aspect of the theme of familiarity concerned each player's knowledge of the other's individual repertoire of gestures. Violin B commented that this was the thing that struck him most about his experience of completing the recall log.

> If I were to say I learned one thing from the whole experience, it was in relation to how the movements I make, the gestures I make, without knowing half the time, and then the gestures I respond to because I play with [Violin A] all the time, I think that a great deal of the skill that.... You know how you can get the best players in the world and they won't be a quartet for a few years? And I think part of that, a great deal of that synthesis that starts to happen, is in this gestural language that starts to be understood. (Violin B)

This shared understanding of one another's gestural repertoire was a result of familiarity with one another's use of gesture from all the time spent playing together in their quartet.

Both players also agreed that their use of particular gestures to communicate different expressive or ensemble ideas was automatic rather than intentional.

> I bet [Violin B] doesn't know.... His leading is obviously much better than mine, because that's what he does, and I bet he doesn't know everything that he does with his body to make me understand him. He must have just learned things that work through trial and error, and not know about them. (Violin A)

Since they have both worked together regularly as part of the same string quartet for a

number of years, both players have developed gestures for leading and following in that ensemble's context that have become automatic, and that they were able to apply during the performance tasks here without discussion or extra attention.

7.3.2.4 Familiarity: The Instrument Itself

Familiarity with the instrument itself was also suggested as an important indicator of the other player's musical or expressive intentions. During his recall interview, Violin B described being able to navigate through the Bach and knowing that there were certain junctures within the music where different expressive decisions would be made. He explained that in addition to gesture, posture, and familiarity with one another's musical tendencies, a shared familiarity with the mechanics of the instrument itself was useful in anticipating what the other player was likely to do at these moments.

> Familiarity not only with each other's playing, but also with the instrument itself.... So for example, if I play a passage and then reach a point at which we could do the second time *forte* or the second time echo, to take a really basic example.... You're also informed by where are they on the bow. How much tilt do they have? I mean, you don't register these things consciously of course. But if they're at the heel of the bow, odds are they're going to do something *forte*, versus something echo, because why would you prepare yourself to be at the heel otherwise? (Violin B)

Both players were able to draw on their expert knowledge of the violin itself, their understanding of its mechanics and use in ensemble settings through their history of quartet playing, as well as both of their experiences as orchestral and chamber musicians. This allowed them to more accurately convey or anticipate one another's intentions at certain points within the music.

7.3.2.5 Trust

Several examples of trust and its importance to moments of empathy or SIF were given by both participants. Violin B described at length the role of trust in successfully negotiating a moment of SIF in quartet performance.

> We just challenge each other to do these things in performance. Trusting that the work's been done..... That all the specifics have been worked out. And say something happens that never happened before in performance. You trust each other that you've explored down all of these pathways, that if one comes up that you've never seen before, then you know how other ones work so you can probably figure it out, and you trust that the others can figure it out and they trust you. There's this backwards and forth: he knows that she knows that.... So, if something new comes up you trust that you can deal with it, and that is being flexible. (Violin B)

His point was that SIF was rooted in trust which was built through rehearsing repertoire together. However, he did not think that there was scope for the same amount and type of SIF in this study since the tasks were artificial: "the test itself is a bit artificial. Playing Bach in unison as two fiddles is weird." The importance of trust between co-performers to the long-term success of a chamber ensemble has also been outlined by Gritten (2013), and was emphasised by several participants in the focus group study.

7.3.2.6 Awareness

There was some discussion during the recall interviews as to whether awareness should be considered intentional or instinctive, and how this might differ in the artificial performance conditions of the present study compared to "real life" performance situations in a chamber ensemble. Violin A stated that she was a very instinctive player, perhaps unusually so. She was unable to code many moments of IA in performance condition 2, when she was following. In contrast, Violin B considered himself a very analytical player.

> [Violin A's] the most instinctive person I know. And I'm much less instinctive and much more analytical. My natural approach, untempered, would be: be in this part of the bow, with this much tilt and this much speed, with this much pressure, and you will by definition make that sound that we want. (Violin B)

Violin B's recall log reflected this analytical approach. His coding for all three

performance conditions was consistent and almost always recorded moments of IA in combination with F. However, he suggested that when he considered co-performer interaction within the string quartet rather than the study's duo performance conditions, he felt that awareness was likely to be partly intentional but often instinctive during performance. Whilst he was forced to take a very analytical approach to following Violin A in performance condition 1 for instance, during quartet performance they would have the benefit of hours of rehearsal, actual quartet repertoire, and different parts to play. He explained that during quartet performance there was more opportunity for an instinctive awareness, although he tended to be intentionally aware even though the two players would be unlikely to play the same melody at the same time with exactly the same sound in the manner of the present study.

> To put it plainly, in the test that we did for you, playing the same music on the same instrument, being in the same part of the bow, and doing the same mechanics makes a lot of sense. In something like Ravel, she could use a meatier sound, and I'm going to completely ghost, because two octaves up, I'm going to be heard no matter what. I'm going to use a much faster bow, I'm going to use no pressure, I'm going to use a different vibrato to her – it might be slightly narrower, maybe slightly faster. But all of these things are a function of what she's doing. So you can imagine a function that transforms what she's doing into what I'm doing. Because ultimately what I'm doing is completely consequent to her choices there. Because it's meant to make her sound good. In this respect, paying attention to where she is in the bow, because that tells me where I am to be in the bow, and what speed she's using, because that tells me how much faster I have to go. There's a sort of relationship. In the test it was one to one. In anything else, there's a relationship, but it's still very linked. (Violin B)

For Violin B, intentional awareness was still very important in the context of ensemble performance. His intentional awareness of the sound production of his co-performers would often directly inform how he would produce his sound in the same moment. It is possible that different players have different approaches with regard to awareness

depending on how they have trained, and their personal strengths and weaknesses.

7.3.2.7 Response

The nature of the performance tasks involved in this study – two violinists playing solo Bach in unison with very limited rehearsal time – was somewhat artificial. Solo Bach would never usually be played by two violinists in unison. Classical chamber ensembles would almost always have more than 15 minutes to rehearse a piece before performing it together for the first time. As a result of these artificial conditions, the recall logs reflected that most of the responses coded in moments of empathy were regarded as flexible (F) rather than expected (R). Violin B argued that to an extent, even with an extended period of rehearsal and in the context of quartet rather than duo performance, responses during moments of empathy were by definition flexible. He suggested that rather than it being a question of the response being flexible or not, it was more that response was always flexible and the question was "how flexible?"

7.3.2.8 SIF

Having acknowledged that the nature of the performance conditions for this study meant that in a sense there was an unusual amount of scope for SIF, albeit in an artificial fashion, Violin B spoke at length about the process of building the ability to be flexible in performance during the rehearsal process as well as maintaining a high level of precision. He explained that these are the two things that the quartet work on in rehearsals: precision and plasticity. He described the quartet's way of working on the area of precision:

> If you're going to play to a really high level, you're going to have to do very specific things, you can't sort of play together, and you can't sort of play in tune, or sort of make the right sound: it has to be precise. And the supreme groups who can play to that standard, they are incredibly exact.... Often-times we'll say such and such is out of tune: fix it. So we'll go and fix it and we'll play it under tempo, we'll play it like robots, you know, we'll play it with loose hands.... You're building the framework for the piece. So that you can do it with loose hands and be really comfortable, and then on top of that, then you introduce proper tempo, you introduce doing it with all of the

> markings – dynamics, accents, whatever. You introduce doing it with all of the phrasings, all of the characters that you might want to do. So then you broaden your level of precision. At root, everything's got to be in tune, ideally, you've got to nail that down. You've got to nail down rhythms, and tempos, and togetherness. Then, you're looking at characters. You're looking at what kind of phrases. How long is this phrase? For that, it's still about precision, because you're agreeing on something that's precise. "This is 12 bars long. It's not 8 + 4, it's 12," for example.... Then you end up building what these characters really are, so that you can repeat it time and time again, you can have this sound that's very compelling. Phrases and characters that are really compelling. (Violin B)

He explained that precision is usually rehearsed separately from plasticity, or flexibility. He described the precision approach as a bottom-up approach, and the plasticity approach as a top-down approach.

> The precision side is a sort of bottom-up approach. Coming at it from the other angle which is: "Notes be damned, let's just see what happens, let's see what we can do with it. Play it at full tempo but just make it really interesting and don't care if you fall off." And this is a sort of top-down approach, and that often liberates you in rehearsal to find new ways of doing things. You still got to do all the groundwork, and so ideally what you're doing is creating not just groundwork towards a single end, but towards multiple solutions. Even though you might not think of them as multiple solutions, because you might only rehearse them once. You're building this repertoire of several different possibilities and the top-down approach of "notes be damned let's see what we can do" can aid you in finding what avenues you might want to pursue. (Violin B)

This plasticity approach allows the quartet the creative freedom to explore different ways of playing the same passage of music, which in turn allow the players to maintain a degree of spontaneity of interpretation during performance. Whilst the quartet agree

on a certain approach to each passage in rehearsal, this top-down approach which allows them to explore multiple possibilities in combination with the time they devote to developing technical and musical precision, allows them to create well-executed moments of SIF in performance.

7.3.2.9 Special Connection

As with the previous studies, some, but not all, moments of empathy were characterised by a special connection between the players. Again, since the performance tasks were rather artificial, this was probably less conducive to moments of special connection than if a quartet performance in a programmed concert had been recorded.

Despite this, Violin A coded moments of SC in all three performance conditions. When asked about these moments during her recall interview, she explained that she felt a special connection to her co-performer when there was a moment of shared understanding when she felt both players were drawing on their shared history of playing together and simultaneously and spontaneously approaching a particular musical moment in the same manner.

> I guess when, either when I kind of drew on our experiences to kind of predict what was going to happen and sensed him doing the same thing. The Kung Fu Panda thing, for example, that's a gesture we've talked about and I just could sense it. It came up, and we both applied it.... Or I guess when something happened and I couldn't predict it, but we both kind of did it instinctively and it just worked. Like, and it didn't feel like a fluke. It felt like a moment of understanding. (Violin A)

In contrast, Violin B did not code any moments of SC in any of the performance conditions. He explained that this was partially due to the artificial nature of the tasks, and mostly due to his misinterpretation of the code.

> What I interpret "special connection" to mean is those moments where, I can remember several of them in life – they always really strike you – and they're moments where you're convinced that you could stand on your head and they'd still be with you. That they

> actually can't not be with you in those moments. That didn't happen on the day. (Violin B)

He viewed the SC code as equivalent to moments of peak performance. These moments are rare, memorable and very special. As Violin B suggested, they may occur only a few times during a performance career. This interpretation accounts for Violin B not coding any moments of SC in his recall log. When asked according to the intended definition of SC whether he thought he might have experienced any such moments, he conceded that he thought there may have been a couple of moments, particularly in the third performance task.

7.3.3 Re-Evaluation of the Process of Co-Performer Empathy

There were some minor changes to be made to the model of the process of co-performer empathy/SIF constructed in the previous studies (Figure 7.2).

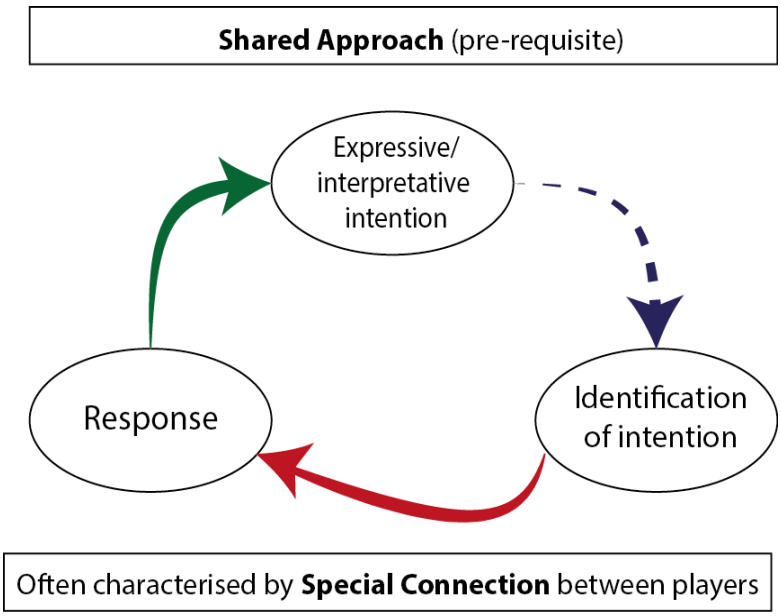

Figure 7.2. Process of co-performer empathy

Firstly, as expressed by Violin B, the first stage in the cyclical process is perhaps better described as an "expressive intention" rather than an "expressive stimulus." The word "intention" suggests the deliberate formation of a certain musical, interpretative, or

expressive idea by one of the players at a given moment. An expressive stimulus, on the other hand, suggests that the idea or approach comes into being without the active input of one of the performers. Violin B explained that the expressive intention was sometimes communicated very deliberately to co-performers, usually when the intention was to create a moment of SIF, or to negotiate a difficult musical moment in performance. He described the way in which he gathers his co-performers' attention in such moments, in order to alert them that he is about to do something unexpected. By gathering their attention in this manner, he is warning or encouraging them to be intentionally aware of his actions in that moment, so that they can identify his expressive intention and then respond appropriately.

The process Violin B uses to alert his co-performers to be intentionally aware of his actions is outlined below:

> When I have something that I want to do, I might lean in a bit and I might say with my body "this is my go," you know, "get in line," "get ready I'm about to do something".... [It's] something we in the quartet call a "butler sweep." Which is silly to say, but it's collecting.... If I'm leading, my job is not only to say "this is what it is," it's also to make eyes and say "I'm about to do something" collect everyone, get everyone on board, and then once I'm sure I have everybody, then do it. And that's part of the preparation.
>
> So, the butler sweep is a way of doing this. You basically sweep with your whole body in some circular motion from the hips and that sort of, you can gather everyone.... It's your responsibility as a leader to gather everyone so that they can't fall off. In the extreme case, if they do fall off it's your fault for not gathering them properly in the first place. The responsibilities overlap, because otherwise you've got 200% responsibility as a leader, but as a follower, in that role you can't just sit there like a dullard and wait to be gathered. Because your job if you're following is to make sure the leader sounds amazing, and you can do that by, again it's these indirect controls, by subtly influencing, by changing ever so slightly the course, and inspiring them to do something they wouldn't have otherwise done. (Violin B)

The “butler sweep” described above is Violin B’s way of gathering the attention of his co-performer(s), encouraging them to be intentionally aware of his actions, so that they can better identify his expressive intention. Both players described using this gesture during the third performance condition to show when they wanted to take control of the music, encouraging the other player to pay close attention in order to be able to identify their expressive intentions. Violin B noted that the butler sweep was a strategy their quartet had devised for specific moments in a performance. These moments tended to be either moments of SIF, or moments of musical complexity where all performers would have to be particularly intentionally aware of the actions and intentions of their colleagues.

In the example above, Violin B describes that active role played by the player(s) following. They have to be alert and intentionally aware, in order to be able to identify the expressive intention of their co-performer, and then to respond appropriately. They cannot sit passively and wait to follow or there will be a delay and the process will be less successful. In her recall interview, Violin A explained:

> [An eminent violinist] always says, you’ve got to be like, you know like how a cat sits upright but at any moment it could just go *gestures* and jump off and kill you? It’s pretty much that. So you’re kind of just standing there and you’re ready, but every single muscle in your body is ready to go in any direction, so you’re super alert. (Violin A)

In this way, the response could be regarded as always being flexible, to a degree. The player is prepared to move in any direction depending on the leader’s expressive intention, how well it is identified by the other players, and how quickly, effectively, and to what extreme the other players are able to respond. As Violin B suggested, perhaps it is better to think of response in terms of degree of flexibility, rather than simply flexible or not flexible. The latter view is perhaps too simplistic in the complex context of ensemble performance.

When asked about the process of musical interaction during ensemble performance, Violin B articulated a process for SIF:

> There's ultimately an infinite loop going on. If somebody lays down something, again taking an extreme example, they never lay it down in a void. You gather whomever you want to play with, you gather them up, and then you show them it's about to happen, and then whilst you're about to do it, and even whilst you're starting doing it, you're judging "are they with me? Is this actually happening?" and if you get a redoubled response, then you might do it more than you originally intended. If you know that they're with you then you'll just do as you wanted, and if they're not paying attention, if their heads are in the part or if you just don't feel their presence, then you're going to scale back.
>
> And so, in this way, even when you're trying to lay it down, you're ultimately being flexible. In this sort of way, the person who ends up leading is the one who is the least skilled in this extreme logic puzzle way of looking at it, because the one who's the least skilled at having a clue what's going on is the one who's going to limit the possibility of what could happen, because the others are going to judge, "Oh, they're not with me." The reason I say it's an infinite loop, is because then from the person-who's-following's perspective, they're going "Yeah OK I'm with you, but I'm giving you this. Are you with me?". So then I have to go, "OK, yeah, yeah, I do recognise this, and I'm doing this in response to your doing that, in response to me doing my thing." This all happens in the moment, several layers deep. (Violin B)

The continuous process of identification and response between leader and follower described by Violin B as they negotiate a given moment within the music reflects the process of co-performer empathy presented above (Figure 7.2). His description of an "infinite loop" concerns the cyclical nature of the process, with the players involved continuously identifying and responding to one another's musical intentions.

The point he raises about the least skilled member of an ensemble being the one who "ends up leading" suggests that the success of the empathic process is limited by the ability of the ensemble's weakest member. Here, "weakest" indicates the member of

the ensemble who is least skilled in being able to transmit, identify, or respond to the other players' intentions. This could be a result of lesser technical skill, as suggested in Davidson and Good's (2002) student quartet case study, where the observations suggested that the members of the quartet were too focussed on their own parts and the technical challenges contained there, and as a result could not spare attention to work on expressive ideas. In a similar way, ensemble players' technical expertise might also influence their ability to divide their attention, looking up from their parts to direct their attention outwards and onto the intentions of their co-performers. It is possible that it may not only be technical expertise but also development of the skills involved in the process of co-performer empathy. After all, many concert soloists are highly skilled, technically proficient musicians, and yet some of these gifted solo performers are insensitive ensemble musicians. This suggests that an ensemble's success in producing expressive, novel performances could be limited not only by the individual technical expertise of the players, but also by how well each player within the ensemble is able to participate in the ongoing, cyclical process of co-performer empathy during performance.

If it is the case that an ensemble's success in producing expressive, novel performances depends on each player's ability to participate in a cyclical process of co-performer empathy throughout a performance, this presents important practical applications for chamber music pedagogy. Whilst trust and familiarity both play critical roles in the development of a successful chamber ensemble, these are developed gradually over time spent rehearsing and performing together. However, it may be possible for techniques for the strengthening of the gathering of co-performers and the identification of expressive intentions to be developed and taught. This possibility will be considered further in the next chapter.

7.3.4 Empathy and Heart-Rate: Results

Data analysis began with an exploration of the participants' recall logs, which recorded incidences of IA, SC, R, and F. There were a few examples of one of these components being coded by itself. However, most often, IA was coded in combination with any of the other codes.

Incidences of IA coded in combination with either R, or F, were categorised as moments of co-performer empathy since these represented the process discerned in the

previous study (see Figure 7.1). Moments of special connection coded alone or alongside other codes were also considered moments of empathy, since these matched the rare moments of spontaneous, simultaneous understanding described by both players in their recall interviews. These moments of empathy were then identified in relation to the heart-rate data for each performance task. For each task, the heart-rate for each participant was then divided into moments of empathy, and moments of non-empathy. Moments of non-empathy were moments which the participants had not coded as moments of self-reported empathy. In order to test the hypothesis that moments of empathy would be characterised by lower cardiovascular arousal, the mean heart-rate in bpm for empathy moments for each participant was compared to the mean heart-rate for non-empathy moments for the same participant in each of the three performance conditions. The mean heart-rate scores for the same participant's empathy and non-empathy moments in each condition were then compared using Mann-Whitney U tests.

For all three performance conditions, Violin A experienced lower heart-rate in moments of self-reported empathy than in non-empathy moments. Performance condition 1 (Violin A leading): self-reported empathy (*M*=112.039 bpm, *Mdn*=114.5); non-empathy moments (*M*=115.7 bpm, *Mdn*=117), *U*=11388, *p*=0.0005 (1-tailed). Performance condition 2 (Violin B leading): self-reported empathy (*M*=97.647 bpm, *Mdn*=98); non empathy moments (*M*=102.63, *Mdn*=104), *U*=3580, *p*=0.00 (1-tailed). Performance condition 3 (no designated leader): self-reported empathy *(M*=93.593 bpm, *Mdn*=93.5); non-empathy moments (*M*=97.918 bpm, *Mdn*=98), *U*=7001.5, *p*=0.00 (1-tailed). Figure 7.3 below shows a comparison of the means for empathy and non-empathy moments for Violin A for each performance condition. The lower heart-rate associated with Violin A's moments of self-reported empathy compared to her non-empathy moments seems to support the experimental hypothesis.

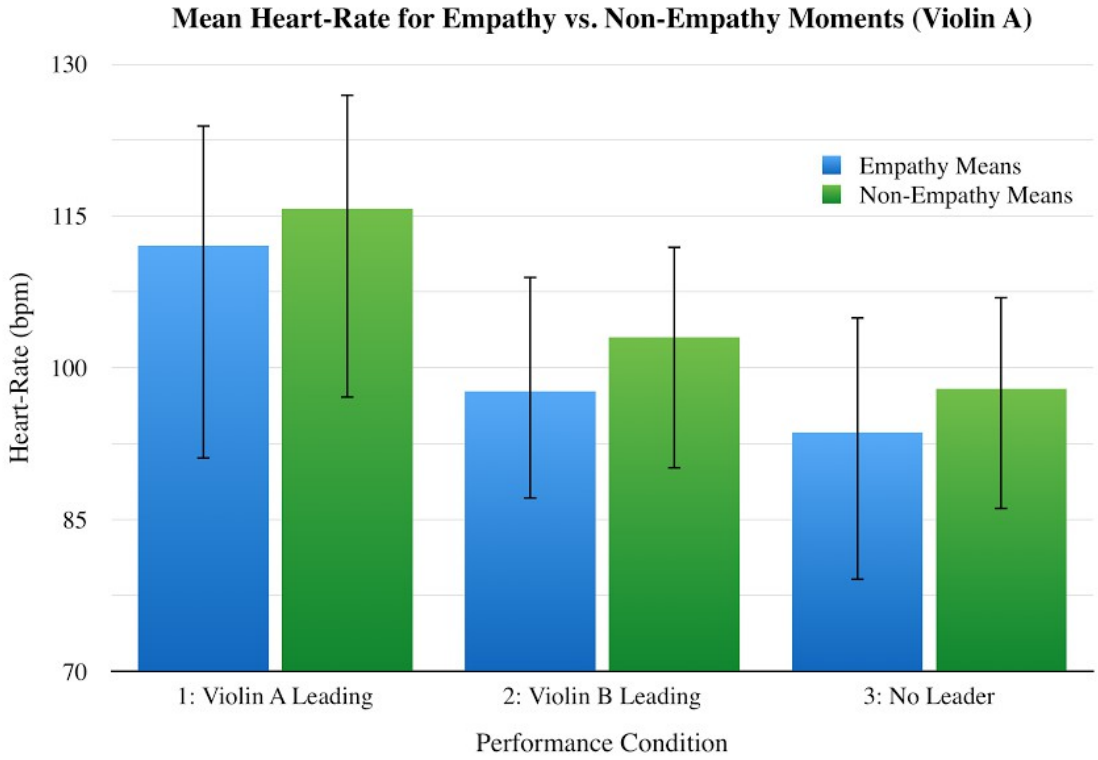

Figure 7.3. Graph showing mean heart-rate for empathy vs. non-empathy moments (Violin A). Error bars represent 95% confidence intervals.

However, Violin B displayed a different comparison of heart-rate between moments of self-reported empathy and non-empathy moments for all three performance conditions. There was no difference between moments for performance condition 1 (Violin A leading): self-reported empathy (M=81.266; Mdn=82); non-empathy moments (M=81.340; Mdn=82), U=9390.5, ns. Heart-rate was higher in moments of self-reported empathy for performance condition 2 (Violin B leading): self-reported empathy (M=88.287; Mdn=89); non-empathy moments (M=86.346; Mdn=87), U=6578, p=0.003. Heart-rate was lower in moments of self-reported empathy for performance condition 3 (no designated leader): self-reported empathy (M=80.288; Mdn=82); non-empathy moments (M=82.352; Mdn=83), U=5205, p=0.03 (one-tailed). One-tailed tests were used since there was a directional hypothesis – that moments of self-reported empathy during ensemble playing would be associated with low cardiovascular arousal. Only the third performance condition showed a significantly lower heart-rate in moments of self-reported empathy compared to non-empathy moments for Violin B. Overall, Violin B's heart-rate results did not support the hypothesis that heart-rate would be lower for moments of empathy, than moments of non-empathy. Figure 7.4 below shows a

comparison of the means for empathy and non-empathy for Violin B for each performance condition.

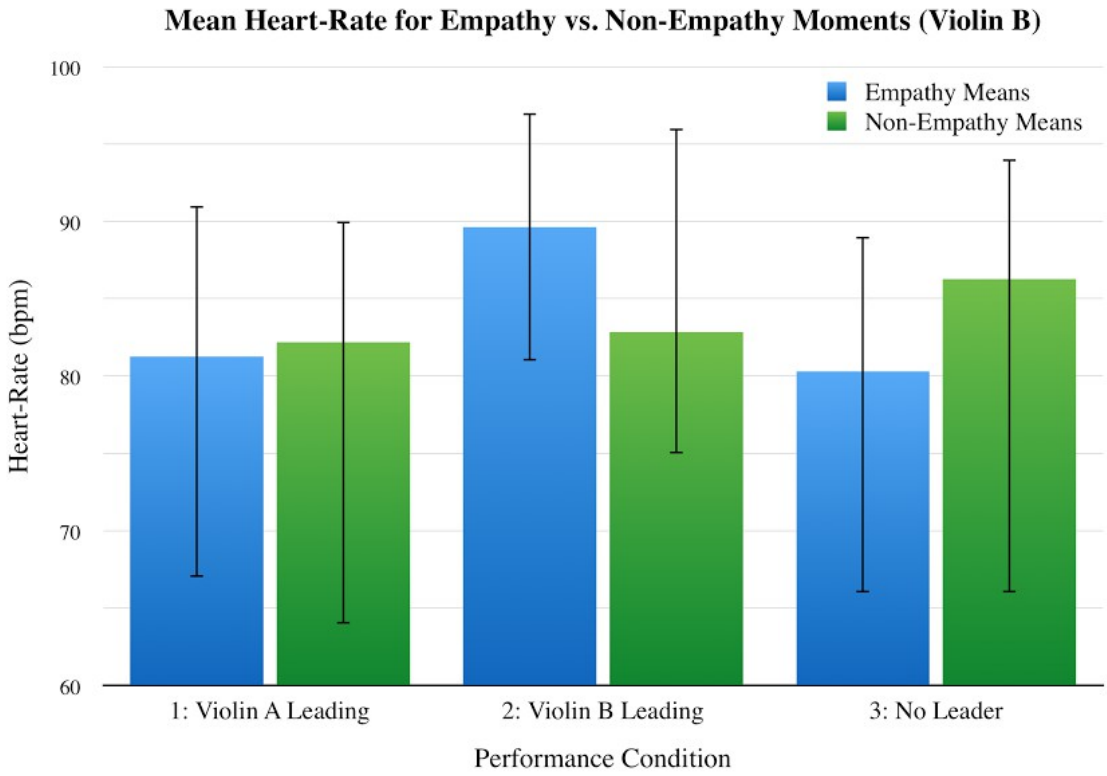

Figure 7.4. Graph showing mean heart-rate for empathy vs. non-empathy moments (Violin B). Error bars represent 95% confidence intervals.

Violin A's moments of self-reported empathy were longer than Violin B's (see Table 7.4). Violin B's consistent coding, as outlined above, was reflected in the length of his moments of self-reported empathy, which were similar across all three performance conditions (2.70s, 3.00s, 3.58s). Violin A's self-reported moments of empathy tended to be longer and less consistent in length across all three conditions. The longer moments (14 seconds in condition 1; 14 seconds in condition 3; 16 seconds in condition 3) were coded as moments of SC. This could account, in part, for the difference in mean length of self-reported empathy moments between Violin A and Violin B, since Violin B did not code any moments of SC. Violin B's moments of self-reported accounted for a higher percentage of playing time than Violin A's for the first two performance conditions.

Table 7.4. Average length of self-reported empathy moments across percentage of total playing time

	Performance Condition 1 (Violin A leading)		**Performance Condition 2** (Violin B leading)		**Performance Condition 3** (No designated leader)	
	Avg. length of moments (s)	% of total playing time	Avg. length of moments (s)	% of total playing time	Avg. length of moments (s)	% of total playing time
Violin A	4.58	26.96	10.70	17.02	6.40	32.32
Violin B	2.70	43.63	3.00	35.10	3.58	21.70

Interestingly, Violin B reported fewer moments of empathy in condition 3, whereas for Violin A condition 3 was the condition with the highest percentage of empathy moments.

7.3.4.1 The Empathy Quotient

The EQ divides scores into four categories: 0–32 = lower than average empathy; 33–52 = average empathy; 53–63 = above average empathy; 64–80 = very high empathy. Analysis of the participants' questionnaires found that Violin A scored 53, indicating that she has above average empathy, and Violin B scored 22, indicating that he has lower than average empathy.

7.3.5 Empathy and Heart-Rate: Discussion

There was variation within each participant for the different performance conditions. Violin A's heart-rate lowered across the three performance conditions. In performance condition 1, in addition to it being the first condition to be recorded, Violin A was responsible for leading. This could have increased her anxiety and, therefore, her heart-rate. Violin A's heart-rate was lower in performance condition 2 than it had been in performance condition 1. In this second performance condition, Violin A was following. During her interview she described enjoying handing over the responsibility to Violin B during that performance condition. This feeling of diminished responsibility could account for the lower heart-rate in this condition. Violin A's heart-rate was lowest in performance condition 3, where there was no designated leader. This could have been because it was the final performance task. It could also have been because, as she

explained during her interview, she viewed it as the least artificial of all three performance conditions. This less artificial setting in which both players were considered to have equal influence, rather than one of them having almost entire control, as in conditions 1 and 2, was likely to be most familiar and to require less active concentration. Despite the general lowering of Violin A's heart-rate across the three performance conditions, her moments of self-reported empathy were associated with significantly lower heart-rate than moments of non-empathy in every performance condition.

Violin B's heart-rate was more consistent across the three performance conditions than Violin A's. It was slightly higher in condition 2. This could be because this was the condition that he was responsible for leading. However, the relation between heart-rate and moments of self-reported empathy compared to moments of non-empathy was different in every performance condition. This could be for any number of reasons since heart-rate is affected by many different factors.

There were a few moments of self-reported empathy in each performance condition that were coded at the same moment for both participants: four in performance condition 1; three in performance condition 2; seven in condition 3. For performance condition 1, of the four moments of self-reported empathy common to both participants, Violin A coded two as SC (once by itself, once in combination with IA, R, and F). Of the three moments for performance condition 2, she coded one as SC by itself. Finally, of the seven moments for performance condition 3, she coded five as SC (three by itself, and two in combination with IA and F). It is not possible to draw any conclusions based on these results since there were only two participants, and since Violin B did not code any moments of SC. However, it should be noted that for the most part, the players did not code moments of self-reported empathy at the same time, and when moments of self-reported empathy were common to both participants, Violin A often coded a moment of SC, either by itself or in combination with another code.

The participants had different scores for the EQ. Violin B scored 22 (lower than average) and Violin A scored 53 (above average). The EQ measures trait empathy, which is a fixed attribute. The different scores may reflect the gender difference between participants, since some existing research has suggested that women score higher than men for trait empathy (e.g. Baron-Cohen, 2011). The difference in EQ scores did not seem to be reflected in the execution of the performance tasks, the recall logs or the interviews. Miu and Balteş (2012) also examined trait empathy, using the

Toronto Empathy Questionnaire (TEQ; Spreng, McKinnon, Mar, & Levine, 2009), and found that there was no association between trait empathy and physiological response. Whilst trait empathy may be a factor influencing co-performer empathy, it is possible to argue that co-performer empathy is a specific type of "musical empathy" which can be trained and developed. Laurence (2008, 2013) has proposed a distinction between a musical empathy, specific to the context of a shared musical experience, and a more generalised concept of empathy. She has suggested that although these two empathies may be related, the context-specific musical empathy cannot be extrapolated into a general empathic process beyond the transient musical moment. In the context of ensemble playing, it seems likely that the process outlined above is that of a context-specific co-performer empathy which, although possibly related to trait empathy, can be trained and developed.

Alternatively, given that Violin A scored higher than Violin B for trait empathy, and Violin A's heart-rate data supported the hypothesis that moments of self-reported empathy would be associated with lower cardiovascular arousal, it is possible that players with higher trait empathy may be more likely to conform to the hypothesis proposed here. However, given that there were only two participants in this study, it is not possible to conclude that this is the case from the data collected here. Individual differences between the participants might account for the differences in their heart-rate results, particularly concerning the relationship between heart-rate and moments of self-reported empathy. The participants were different genders. Violin B had a lower resting heart-rate (52.23 bpm) than Violin A (72.54 bpm). He also scored lower on the EQ (22) compared to Violin A (53). During their recall interviews, both participants independently asserted that Violin A was much more instinctive in her approach to ensemble playing, and that Violin B was very analytical in his approach. This was also reflected in the participants' recall logs, with Violin B consistently coding moments of IA + F for every performance condition, whilst Violin A's recall log was much more varied in terms of number and type of moments coded. As a result of these individual differences, and particularly with regards the small sample size, it is not possible to determine why the results of the heart-rate analysis are different for each participant, nor is it possible to draw a strong conclusion regarding the study's hypothesis.

7.4 CONCLUSION

This study was intended to be a preliminary exploratory case study to test a multi-method approach for investigating the relation between co-performer empathy in ensemble playing and physiological response – heart-rate. In terms of the relationship between co-performer empathy and heart-rate, whilst Violin B's heart-rate results were inconsistent, Violin A's results indicate that heart-rate may potentially be a useful physiological indicator of co-performer empathy. However, further work with greater numbers of participants, and more control over individual differences (e.g. gender, EQ score, and resting heart-rate) is necessary before any stronger conclusions can be drawn. Meanwhile, the findings of the recall log and interview data analysis offered further insight into the process of co-performer empathy itself. This novel multi-method approach to investigating co-performer empathy in ensemble playing allowed the self-report data to be strengthened by heart-rate as an objective, physiological measure. It offered rich qualitative data on the process of co-performer empathy, as well as quantitative data on the players' physiological responses at self-reported moments of empathy. In addition, the use of the EQ to provide further data on the participants' trait empathy scores offered an indication of the possible relationship between co-performer empathy and trait empathy. This novel multi-method approach to this area of research was effective and future research on empathy in performance may benefit from adopting a similar approach.

Aside from the small sample size, a further potential limitation of this study was that no restrictions were placed on the participants with regard to conferring about coding. The participants did not code the video at the same time, nor did they look at each other's recall logs to compare coding. However, both mentioned that they had discussed the definitions of the codes before they had started to complete the logs. On the one hand, this means that the definitions of codes, with the exception of special connection as discussed above, are consistent across both logs. However, it is possible that a discussion of the kinds of moments that might be coded as empathic may have limited the scope for each code. Given that the participants' logs were different, and different moments and examples of empathy were given by each player, it seems unlikely that this has adversely affected the data collection here. However, it is worth reflecting on this method of code-specific video recall as a means of accessing participants' individual responses to, and perspectives on, pre-defined moments. In

addition, the participants were allowed one week following the original recording session to complete their recall logs. Since both participants were professional musicians with busy concert diaries, this was in recognition of the demands on their time. Ideally, the recall logs would be completed as soon as possible after the original recording session, and at a similar point in time for both participants where possible. Finally, since the data collection had to be repeated, it is possible that order effects may have occurred, giving the participants a preconceived notion of each other's interpretations of the Bach, for example, that might otherwise not have arisen.

The cyclical process for co-performer empathy in ensemble playing was refined, based on the analysis of the participants' recall logs and interviews, to incorporate a first stage of an expressive intention. The response stage of the model was considered to be on a spectrum of flexibility, rather than simply flexible or not flexible. The importance of familiarity and trust to the process was emphasised. The recall interviews also provided further insight into the strategies employed by these expert chamber musicians to identify and respond to a co-performer's intentions. The concluding chapter of this thesis will revisit the aim, objectives, and research questions of this thesis, will examine this final model for co-performer empathy in greater depth and with reference to other models of ensemble interaction, and will consider the implications of the findings here for chamber music pedagogy and for ensemble performance more broadly.

CHAPTER 8. CONCLUSIONS

8.1 RESEARCH QUESTIONS

Responses to the three research questions posed in the first part of this thesis (see Chapter 2) are given below.

8.1.1 What is The Relationship Between Ensemble Musicians' Experiences of Optimal Experience and Their Experiences of Co-Performer Empathy?

Existing studies of empathy in ensemble playing have suggested that empathy is important for the long-term functioning of an ensemble (Myers & White, 2011), as well as being an essential facilitative tool for social and musical interaction during the rehearsal process (Haddon & Hutchinson, in press), and in performance (Seddon, 2005; Seddon & Biasutti, 2009). The optimal experience literature reviewed in Chapter 1 suggested that players' optimal experiences of ensemble performance tended to feature a collective state of mind between co-performers that may be a result of shared empathic processes in rehearsal and performance (e.g. Sawyer, 2006). Study 1 of this thesis addressed research objectives one (to construct a model for the relationship between optimal experiences of performance and co-performer empathy) and two (to identify components of co-performer empathy). The model of the relationship between optimal experiences of ensemble performance and co-performer empathy is shown in Figure 8.1.

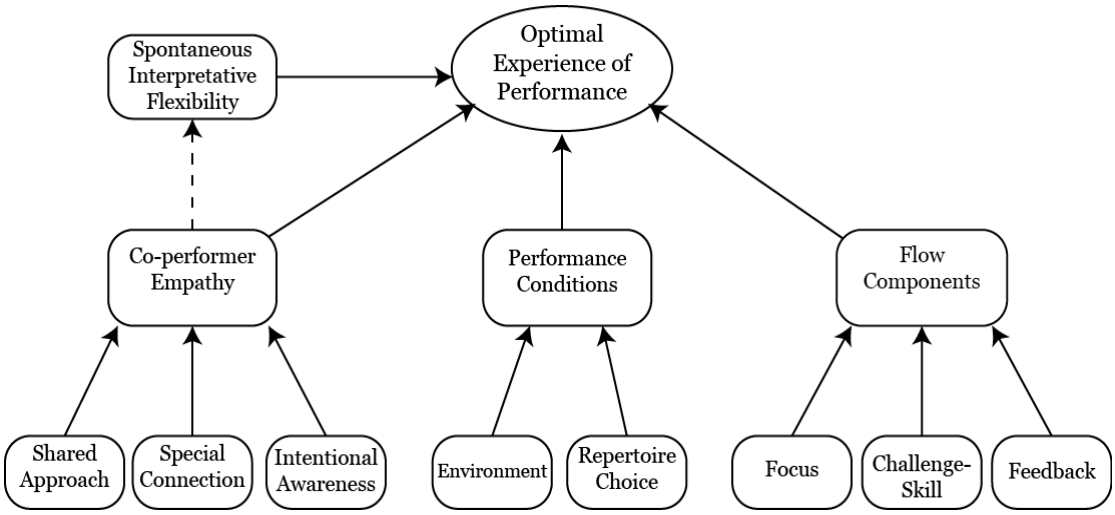

Figure 8.1. Optimal experiences of ensemble performance and co-performer empathy

It was found that optimal experiences of ensemble performance are a result of co-performer empathy, four flow components (challenge-skill balance, concentration, feedback, and clear goals), and two performance conditions (repertoire choice and environment). SIF was a feature of almost all of the accounts of optimal experiences of performance, and the results of Study 1 found it to be closely connected to co-performer empathy.

Three components of co-performer empathy were identified as a result of the analysis of the focus group interviews: a pre-requisite shared approach to the music and to working together, a special connection between players, and an intentional awareness how one's co-performers are operating on both a musical and a practical level. The focus group interviews were conducted with different types of ensemble: a string quartet, a mixed piano trio, a wind quintet, a vocal duo, a contemporary woodwind trio, and three brass ensemble members. This variety of ensembles was recruited to ensure that the findings of the study were not just particular to one type of ensemble. However, there were a few differences between ensembles. The string quartet scored higher than the other ensembles for the shared approach component of co-performer empathy. This was likely due to difference in ensemble and experience. The vocal duo scored higher than the other ensembles for intentional awareness and repertoire choice. This was probably due to a difference in ensemble behaviour between singers and instrumentalists. The mixed trio scored lower for the special connection component of co-performer empathy than the other ensembles did. This could be due to differences in experiences or in ensemble dynamics.

Drawing on the results of Study 2 and Study 4 as well as Study 1, it seems possible that the special connection component of co-performer empathy, is more prevalent in optimal experiences of ensemble performance. The members of the expert ensembles interviewed in Study 1 all described this special connection as a central feature of their optimal experiences of ensemble performance. Studies 2 and 4 found that a process of co-performer empathy was often, but not always, characterised by a special connection between players. It seems possible that players may perceive greater prevalence of special connection during optimal experiences of ensemble performance, but further research would be required to explore this possibility since it was not directly addressed by any of the empirical studies here.

8.1.2 How Do Ensemble Musicians Describe Co-Performer Empathy?

One of the aims of Study 1 was to find out how expert ensemble musicians talk about their experiences of co-performer empathy. Analysis of the interview transcripts revealed three components of co-performer empathy: shared approach, special connection, and intentional awareness. The shared approach component was seen as a pre-requisite to co-performer empathy and encompassed a shared approach to the music and to working together. The players used a variety of expressions to describe the shared connection component: "gelling," "exactly synchronised," "an intimate connection," "in harmony," "eyes," "ears," "radar," "instinctively aware," "sympathy," "clicking," "locking in," "getting into each others' heads," "being able to read the other person's mind." The intentional awareness component encompassed both practical and musical aspects, including an awareness of the role of each player within the music at any point. Analysis of the recall interviews based on the participants' coding of the intentional awareness and special connection components of co-performer empathy in Study 2 found that the string quartet members considered co-performer empathy to involve a process of perspective-taking. The cellist described a particular moment in which herself and the players of the other two lower parts had to imagine that they were playing the first violinist's part with her in order to anticipate the precise moment and mood of a dramatic ensemble entry. The players suggested that an intentional awareness of the actions of the other players during performance tended to lead to the feeling of a special connection between them. In Study 4, Violin A described her understanding of special connection as a moment of shared understanding with her co-performer in which they both agreed on a particular approach or expressive detail instinctively during performance.

In addition to discussing the process of co-performer empathy and describing the three components, participants in Study 1 and Study 4 identified two additional factors which they felt were essential for co-performer empathy to be established during performance: trust and familiarity. Participants felt that trust between co-performers was important for being able to identify and respond to one another during performance. The players in Study 4 described four different aspects to familiarity: established dynamics, musical tendencies, gestural repertoire, and the instrument itself. According to the participants, familiarity with a co-performer's musical tendencies and gestural repertoire, allowed them to better anticipate their musical or expressive intentions

during performance, resulting in more successful co-performer empathy or SIF.

8.1.3 What is The Process of Co-Performer Empathy?

Research objectives three and four were to outline a definition and a process for co-performer empathy. Co-performer empathy in expert ensemble playing is an ongoing cyclical process during performance, based on a pre-requisite shared approach to the music and to working together. It involves an intentional awareness to identify the expressive intentions of one's co-performers and then to respond appropriately. The process of co-performer empathy is shown in Figure 8.2.

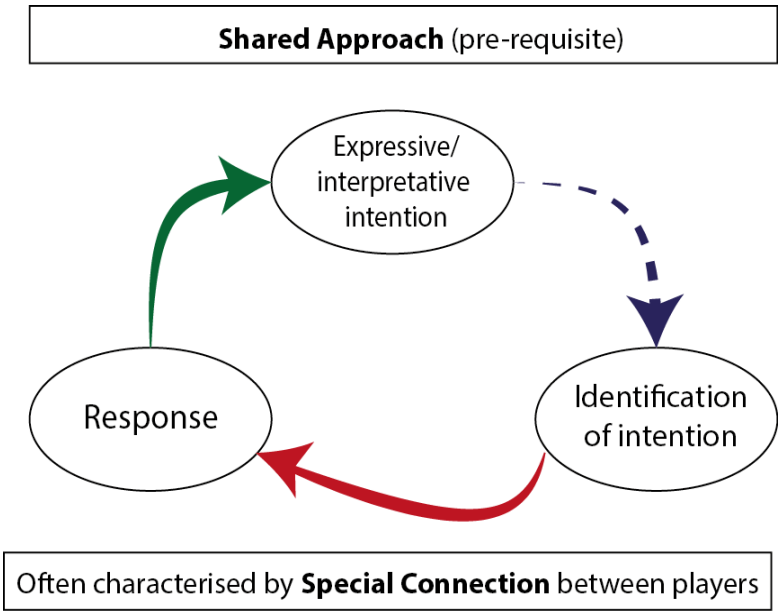

Figure 8.2. The process of co-performer empathy

Study 1 identified the three components that featured in the ensemble members' accounts of co-performer empathy: shared approach, special connection, and intentional awareness. Study 2 employed a video-recall method to investigate the process of co-performer empathy with members of an expert string quartet. Through an analysis of the players' recall logs and interviews a cyclical process of co-performer empathy was constructed. The process was likened to the process of empathy as defined by Baron-Cohen (2010). It was based on the shared approach component, and involved the identification of an expressive stimulus through an intentional awareness, and an

expected or novel response. Finally, Study 4 employed a similar video-recall method during three performance conditions with an expert violin duo. Analysis of the recall logs and interviews resulted in the final model for co-performer empathy presented above (Figure 8.2). This final model begins with an expressive intention by one player, rather than the expressive stimulus from the previous model. The response in the previous model had been described as either expected or novel. However, analysis of the interviews from Study 4 suggested that the response stage of the process was better thought of as being on a spectrum of flexibility, rather than simply being novel or expected (flexible or not flexible).

Having constructed a model for the process of co-performer empathy in expert ensemble playing, it is important to place this model in the context of existing research on musical interaction in ensemble playing. McCaleb (2014) has proposed a paradigm of inter-reaction which provides a new framework for understanding the process by which ensemble performers interact and share information during performance. The framework was developed through an embodied approach to understanding co-performer interaction. It involves three stages: transmitting, inferring, and attuning. The butler sweep described by the violinists in this study is similar to McCaleb's stage of transmitting. However, the findings of this study suggest that the intentional transmission of a performer's expressive intention to the other players may be found only in moments of SIF, and occasionally in moments of musical complexity. Rather than emphasising a stage of transmission, which may be intentional or unintentional depending on the circumstances of a particular moment, the co-performer empathy model beings with an expressive intention, and places the emphasis instead on the co-performers' awareness of that intention, in order to identify and respond effectively.

Keller (in press) has suggested that the production of novel variations in ensemble performance is a complicated group process, involving inter-individual co-variation. He has proposed two "online strategies" (2008, 2012) that are employed by ensemble musicians during performance in order to coordinate musical and expressive ideas: prioritised integrative understanding, and anticipatory cognitive-motor mechanisms. These cognitive-motor skills interact to allow a performer to anticipate, attend and adapt to auditory or visual cues generated by co-performers during a performance. The co-performer empathy model proposed here fits well with Keller's online strategies. Crucially, the co-performer empathy model includes a pre-requisite shared approach to the music and to working together, and a recognition that the process

is sometimes characterised by a special connection between players. These two aspects of the process of co-performer empathy are not present in McCaleb's model of inter-reaction, or within Keller's online strategies for coordinating musical ideas.

Finally, it was found that, as initially suggested in Study 1, there was a close connection between the process of co-performer empathy and SIF in ensemble performance and had found SIF to be a feature of almost all the accounts of optimal experiences of performance. Study 2 revealed SIF to be a case of intense co-performer empathy, a similar process of identification and response, involving a greater intentional awareness to more effectively identify the expressive intentions of one's co-performers. Study 3 offered further support to the assertion that SIF was a case of intense co-performer empathy, with participants' recall logs showing that SIF was often coded in combination with intentional awareness, and sometimes with special connection. Analysis of the recall logs and interviews during Study 4 suggested that perhaps it would be better to think of the process of co-performer empathy as almost always resulting in some degree of SIF. Perhaps the response stage of the process in particular might be considered as being on a spectrum of SIF, with an entirely expected response at one extreme and a novel response at the other extreme.

8.2 IMPLICATIONS

The fifth and final research objective for this thesis was to consider potential techniques for developing co-performer empathy in student ensembles. Although this was not the aim of any of the empirical studies, analysis of the interview data from Studies 1, 2, and 4 offered some insights into this objective.

8.2.1 Potential Techniques and Exercises for Developing Co-Performer Empathy

Three techniques are highlighted below to provide a starting point for student musicians working in ensembles.

1. Butler sweep: During interviews with the quartet musicians in Study 2 and the duo musicians in Study 4, participants described various analogies for and approaches to the identification stage of the process of co-performer empathy. In Study 4, Violin B described the butler sweep as a means of gathering the

attention of his co-performers to alert them that he was about to do something that they would need to identify and respond to. He explained that this strategy was important for gathering the attention of the other players when one player wanted to do something novel or difficult during performance. This gesture for alerting co-performers that something is about to happen is one that could be taught to and perfected by student ensemble musicians. It would help to facilitate and strengthen the process of co-performer empathy, and SIF in particular, in ensemble playing.

2. Pouncing Cat: Violin A likened an alertness to the possible changing intentions of a co-performer as feeling like a cat, ready to pounce in any direction at any moment. She herself was described as an instinctive player, in that she felt she was instinctively aware and alert to the changing intentions of her co-performer during the study. However, at a less expert level, this awareness needs to be developed so that players are able to identify and respond effectively to their co-performers' musical intentions.

3. Perspective-Taking: In Study 2, the violist described a technique for combating nerves during a performance which could be employed as a technique for improving this ability to identify these intentions. Using this technique, the players would pick another member of the quartet to focus their attention on whilst playing. She commented that this resulted in hearing the piece from another player's perspective, as though they themselves were playing the part with that player. This exercise in perspective-taking allows the player to decenter and identify the intentions of another player through an intentional imagination.

It is possible that exercises for improving co-performer empathy during performance could be developed for use in rehearsals. Trust and familiarity have been identified as factors that may contribute to the development of an empathic process in an ensemble's playing as articulated below.

1. Developing trust through social bonding: As indicated in Study 1, the process of developing a special connection between players began with complementary personalities, but developed through the establishment of a socio-emotional

connection through social bonding experiences, and time spent rehearsing together. It seems likely that trust is developed through such shared experiences (see also Gritten, 2013).

2. Increased familiarity: Familiarity is likely also developed through time spent rehearsing and performing together (see King 2013), through which players become familiar with one another's musical tendencies, and gestural repertoire.

8.2.2 Implications for Music and Empathy Research

This research has explored how empathy may facilitate musical interaction and SIF in ensemble playing. The findings of Study 4 suggested that co-performer empathy is a context-specific musical empathy rather than being related directly to trait empathy. Whilst trait empathy may be a factor influencing co-performer empathy, it seems likely that co-performer empathy is a specific type of musical empathy which can be trained and developed. This supports the work of Laurence (2008, 2013), who has distinguished between a musical empathy, specific to the context of a shared musical experience, and a more generalised concept of empathy. Laurence proposes that although these two empathies may be related, the context-specific musical empathy cannot be extrapolated into a general empathic process beyond the transient musical moment. In the context of ensemble playing, it seems likely that the process of co-performer empathy is also a context-specific musical empathy which, although possibly related to trait empathy, can be trained and developed. This further highlights the necessity for techniques for developing or strengthening the skills required for co-performer empathy to be tested and taught.

It seems likely, in light of the findings of studies 2 and 4, that a performer's capacity for co-performer empathy and SIF in ensemble performance may depend strongly on technical expertise and ensemble playing experience, rather than a performer's trait empathy. In Study 4 here, Violin B scored lower on the EQ than Violin A did, but he coded more examples of moments of self-reported empathy during the recall tasks. Equally, there are many anecdotal accounts of highly regarded string quartets whose members reportedly argue constantly inside and outside of the rehearsal studio, who might score quite low for trait empathy but who perform together at a very high standard and to great critical acclaim.

Violin B also commented during his interview that the least skilled member of an ensemble usually "ends up leading", suggesting that the empathic process is limited by the ability of the ensemble's weakest member, rather than necessarily by the member with the lowest trait empathy score. This seems to support Davidson and Good's (2002) observation that less expert, less experienced ensemble musicians tended to focus more on their own individual parts and were less able to divert their attention to others' parts or to work on expressive ideas. Yet, it seems likely that co-performer empathy and SIF depend not only on a performer being an expert musician, but also being an experienced and skilled ensemble musician. After all, many concert soloists are highly skilled, technically proficient musicians, and yet some of these gifted solo performers are insensitive ensemble musicians. So, whilst it is possible that a high score for trait empathy may be advantageous in some way, it seems likely that technical command of one's instrument, and the development of ensemble playing skills – such as the three techniques outlined above – are more important for achieving co-performer empathy and SIF in performance.

8.3 LIMITATIONS

The main limitation to Studies 2, 3, and 4 is that they were observational case studies. As outlined in Chapter 3, the phenomenological approach to this research requires rich, qualitative methods of data collection. Interviews in combination with observational case studies were considered the most appropriate methods of data collection (Schütz, 1932/1976). The participants for these studies were selected because they fulfilled the criteria for this thesis, being expert, established ensembles. The string quartet in Study 2 and Study 3, and the violin duo in Study 4 comprised professional musicians who had played together in their respective ensembles for more than three years. However, the main drawback to this case study method is that the findings of the analyses are based only on the data gathered from one particular, small set of participants. Using different participants for Study 1, Studies 2 and 3, and Study 4 was one means of attempting to ensure that the data gathered in one study supported the data gathered in the other studies, despite the case study approach.

The present research was designed as four standalone studies, each building on the findings of the previous ones to examine the conceptualisation and process of co-

performer empathy in expert ensemble playing. However, a longitudinal study involving the same expert ensemble over a longer period of time might have allowed questions concerning the development of co-performer empathy to be addressed. This may be an interesting future direction for research on the development of co-performer empathy.

It is possible that comparing the frequency of coded SIF in rehearsal and coded SIF in performance in studies 2 and 3 may not have taken into account the difference in intention between the two situations. In rehearsal, players are more likely to be agreeing on interpretations and practising difficult passages. In performance, players, according to the interview data from both studies, are striving to produce moments of SIF. In addition, the difference in time-frame between the rehearsals (90 minutes) and the performance (9 minutes) did not allow for valid comparisons in coding frequency to be made between the two situations. In addition, players only coded their own recalled individual moments of SIF, without reference to the individual moments of SIF coded by their colleagues. Perhaps future work using a similar method might benefit from the addition of an opportunity to review and consider other players' coded moments in an attempt to assess an ensemble's experience of SIF as a whole unit, rather than as individual players.

It is worth considering how far the model of co-performer empathy and SIF may be applied to ensembles of different types and sizes, and to different musical styles. Study 1 involved several different types of ensemble – both instrumental and vocal – and found that co-performer empathy and SIF were experienced by all the participants involved. However, only string quartets and an artificial violin duo were involved in studies 2, 3, and 4, so although it is likely that the process of co-performer empathy occurs in a similar manner in other instrumental ensembles, it is not possible to say for certain. For example, existing research (e.g. Murnighan & Conlon, 1991; King, 2006) has shown that string quartets have a particular social structure. This may not be the same for other types of small ensemble, so it is possible that other ensembles may function differently, and so the process of co-performer empathy may exist but differ slightly with ensemble type.

The present research has examined only small, expert, ensembles playing Western Art music. It seems possible, given the process of identification and response involved in co-performer empathy that the process may also apply to other styles of music, perhaps even being more pronounced in improvised styles, for example. However, it was beyond the scope of this study to examine co-performer empathy and

SIF in relation to other musical styles. It also seems possible that the process of co-performer empathy may apply to larger ensembles such as dectets or even orchestras, although it is likely that the process will become more complex with more participants. Again, co-performer empathy in larger ensembles was beyond the scope of the present research.

8.4 CONCLUSIONS AND DIRECTIONS FOR FURTHER RESEARCH

The research presented here has found that co-performer empathy is a central feature of expert ensemble musicians' optimal experiences of performance. In addition, it has been found that co-performer empathy is the process responsible for SIF in ensemble performance. The process of co-performer empathy itself is based on a pre-requisite shared approach to the music and to working together. It involves an identification of co-performers' musical intentions, through an intentional awareness, followed by a response to those intentions. Co-performer empathy seems to be a context-specific musical empathy which, though potentially related to trait empathy, may be trained and developed. Suggestions for potential techniques that may be employed for strengthening or developing the skills involved in the process of co-performer empathy have also been proposed.

The present research has investigated co-performer empathy in expert Western Art ensembles. Future research might examine the same process in other genres of small ensemble, or with participants of different levels of expertise. It would be interesting to determine whether a similar process of co-performer empathy occurs in the performance of improvised music, for example, or in an amateur classical ensemble.

This research has not considered the role of gesture in co-performer empathy. The participants in the video-recall studies alluded to the information conveyed through their gestures when viewing the video data:

> The thing that most struck me was how much movement makes such a difference especially in a quartet, because the moments where we'd speak about it "let's do this here," and the difference in movement between the time before and the time afterwards was everyone would do something different movement-wise, and everyone would move together, and would then do the same thing. (First Violinist, Study 2)

Movement in performance is not secondary to sound, but plays a part in the larger music experience. Gestures and actions in ensemble playing are loaded with musically relevant information. The violinists in Study 4 described their use of one particular gesture, the butler sweep, for gathering the attention of their co-performers. They considered this an important gesture, essential for the successful execution of SIF in performance. Non-verbal communication is the primary means of conveying information between co-performers during performance (e.g. King & Ginsborg, 2011). As such, future research might consider the role of gesture in the process of co-performer empathy.

This research has combined interviews, both individual and group, with observational case studies, as well as quantitative methods such as acoustic analyses and physiological measures. The exploratory heart-rate study with an expert violin duo has laid the groundwork for further investigations combining self-report methods with more objective measures of empathy. Future work might examine the relationship between co-performer empathy and other physiological measures, as well as investigating further the relationship between co-performer empathy, trait empathy, and heart-rate in greater depth. Empathy research in other fields has shown that physiological measures have had some success in indicating when an individual is experiencing empathy (e.g. Krebs, 1975; Levenson & Reuf, 1992; Westbury & Neumann, 2008), so the application of these measures to empathy in ensemble playing might yield some interesting results.

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APPENDICES

APPENDIX I

Study 1: Focus Group Interview Guide

Can you tell me the story of your ensemble?

- How long have you worked together?
- What kind of work have you done together?
- What are you doing now?

What have been the high-points of your ensemble career together?

What has been your strongest, most intense performing experience as an ensemble?

- Where?
- When?
- Circumstances? (performance, rehearsal, recording, audience etc.)
- How did you feel?

Have you had many similar experiences?

What qualities do you look for in an ensemble member and why?

Have any of you had other experiences, perhaps playing with other musicians, where it hasn't worked so well?

What is your understanding of the word "empathy"?

Do you think you experience empathy with the other members of your ensemble when you work and perform together?

Is there a different word you would use in the context of music, other than "empathy"?
What motivates you to play chamber music?

APPENDIX II

Studies 2, 3, and 4: Individual Video Recall Interview Guide

How did you find the experience of coding the video excerpts?
Was there anything that particularly struck you?

For each code:

- Can you tell me about the kinds of moments that you logged as examples of this code?
- Can you show me a specific example of this type of moment on the video, and talk me through what is happening?
- Was this type of moment important?
- How does this type of moment fit into your working process in rehearsals?
- How does this type of moment fit into your experience of performing together?

Based on your experience of logging these different types of moment, how do these moments relate to one another:

- In rehearsals?
- In performance?

APPENDIX III

Video Recall Log Instructions (Study 2 and Study 3)

The accompanying DVD contains five video excerpts from your recent rehearsals and performance of Pulse Magnet. The content and length of the clips are briefly outlined in an excerpt list at the bottom of the page. This project explores co-performer empathy and flexibility of interpretation in performance. Rather than me, an external observer, viewing the clips and attempting to interpret (guess at) your actions or intentions, the idea is for you to view each clip yourself and answer some questions as you watch. The questions will ask you to note down moments in each clip when you think you might have experienced a certain thing. There are no right or wrong answers.

Please view each clip and identify and comment on:

1. Moments when you felt a conscious awareness of how (any of) your colleagues were operating on a musical level. (This might include balancing dynamics, accommodating tempo changes, following leads etc.)
2. Moments when you had a conscious awareness of how (any of) your colleagues were operating on a practical level. (This might include an awareness of practical or physical problems facing others, energy levels etc.)
3. Moments when you felt a special connection to any of your colleagues. (Examples might include feeling "in each others' heads" or being "in the zone together")
4. Moments when you felt you were being spontaneously flexible or creative in your approach/playing/interpretation. (Examples might include you interpreting your part in a different way from usual, or being aware that one of your colleagues was doing something different and adjusting)

Please note down the time in the recording for any moment you identify (start and finish) and give a brief explanation or description of what was happening at that moment.

APPENDIX IV

Formulae for Calculating Tempo Deviation

1. Convert Tempo Interval measurements to bpm measurements (time per beat -> beat per time)

Let x_i represent the i^{th} interval measured in a given condition (P1, P2, or R) in seconds

Let p_i represent the i^{th} tempo marking (in beats per minute) implied by interval x_i

Then,

$$p_i = \frac{60}{x_i}$$

2. Calculate mean tempos for each run to use as a baseline for comparisons.

Let $\bar{p}_a$ represent the arithmetic mean of condition *a*, where *a* is P1, P2, or R

Then,

$$\bar{p}_a = \frac{\sum_{i=1}^{n} p_i}{n}$$, where *n* is the number of entries in condition *a*

3. Calculate percentage deviation from the mean for each condition

Let d_i represent the percentage deviation of the tempo marking p_i from its mean $\bar{p}_a$ for a given condition *a*

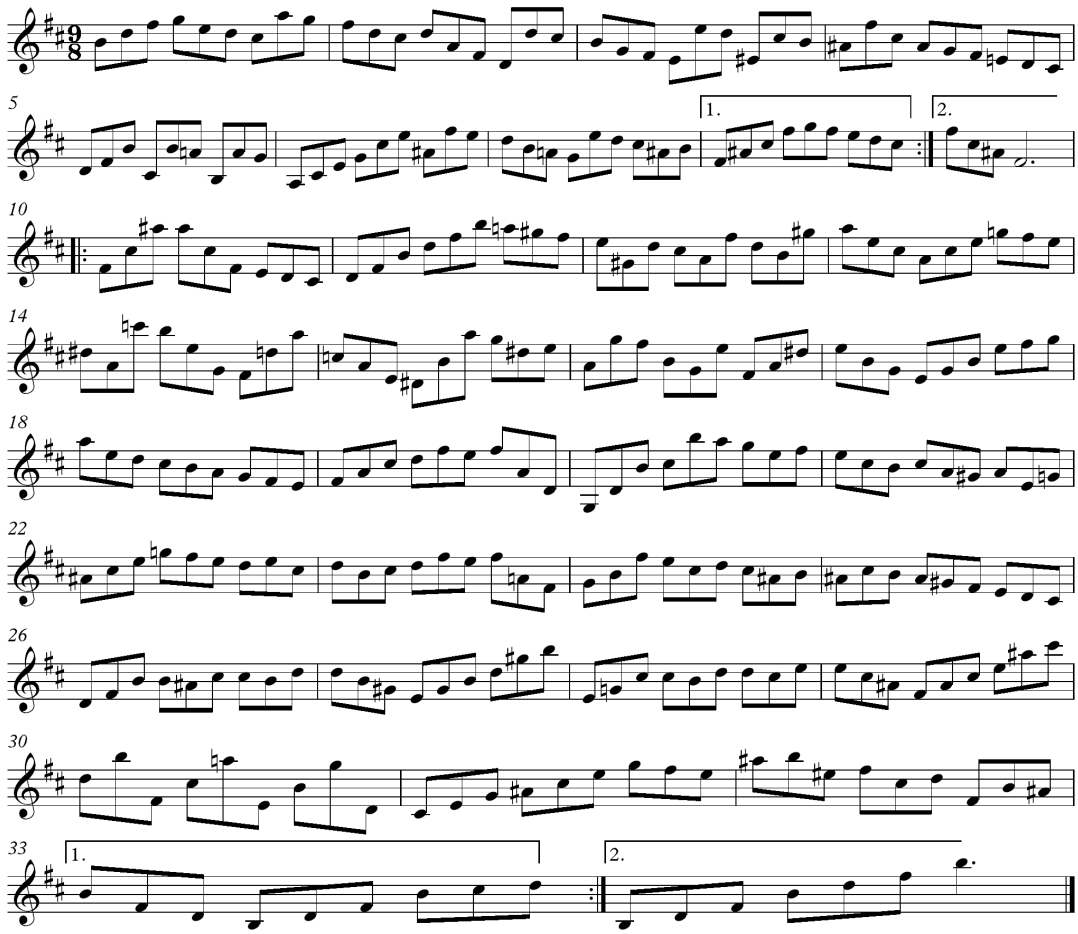
Then,

$$d_i = 100\left(\frac{p_i - \bar{p}_a}{\bar{p}_a}\right)$$

NB: *d* can be negative if p_i is less than the average tempo for that condition.

APPENDIX V

J.S. Bach: B Minor Double from *Partita No. 1*



APPENDIX VI

Recall Log Instructions for Study 4

The accompanying DVD contains three video excerpts from your recent recording session. This project examines co-performer empathy in the three different playing tasks. Rather than me, an external observer, viewing the clips and attempting to interpret (guess at) your actions or intentions, the idea is for you to view each clip yourself and note down moments in each clip when you think you might have experienced a certain thing.

There are no right or wrong answers. The descriptions for the log sheet below are deliberately vague so that you can interpret them in whatever way makes most sense to you.

Log Sheet:

There are four different kinds of moment to be identified and briefly described for each clip. Please view each clip and identify and comment on moments of:

1. Intentional Awareness: Moments when you felt a conscious awareness of how the other player was operating on a musical level.
(This might include an awareness of the other player's tempo, dynamics, sound, following leads or other gestures etc.)

2. Special Connection: Moments when you felt a connection to the other player.
(Examples might include feeling "in each others' heads" or being "in the zone together")

3. Response: Moments when you felt that you responded or reacted to an expected musical action of the other player
(e.g. changing your tempo or dynamics to fit with the other player's, as established in rehearsal)

4. Flexibility: Moments when you felt you were being spontaneously flexible or

creative in your approach/ playing / interpretation.
(Examples might include you interpreting your part in a different way from usual, or being aware that the other player was doing something different, and adjusting)

N.B. There will be instances of overlap between the four moments – this is fine. For instance, you may have been aware [1] that the other player was doing something, and may have responded flexibly [4] since it was not what you would have usually done.