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# THE EXPERIENCE OF SOCIAL FLOW IN VOCAL JAZZ IMPROVISATION

by  
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A thesis submitted to the Graduate College  
in partial fulfillment of the requirements  
the degree of Master of Music  
School of Music  
Western Michigan University  
August 2015

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# THE EXPERIENCE OF SOCIAL FLOW IN VOCAL JAZZ IMPROVISATION

Brittany Lee Neuser, M.M.

Western Michigan University, 2015

The purpose of this study was to evaluate the feasibility of experimental research procedures and gather initial data in studying the experience of social flow within the context of group music production tasks. Participants completed two different group vocal music production tasks: Performance of a pre-composed song and an improvised performance. The Flow State Scale-2 (FSS-2), a 36-item survey in which a mean score of 45 implies the ultimate flow experience and a score of 9 implies that no flow was experienced during the event in question, was used to assess the level of social flow experienced by the participants in each condition. Results indicate that the participants experienced social flow in both the standard performance ( $M = 37.06$ ;  $n = 4$ ) and in the improvised condition ( $M = 34.25$ ;  $n = 4$ ). Because the primary purpose of this study was to test the feasibility of the design and procedures, a small sample was used, smaller than what might even be used in a pilot study. As such, statistical analyses comparing the two group means were not conducted because the study was insufficiently powered. Data collection went as planned and the initial data suggests that the experimental research procedure employed in this study could be an effective approach in further investigating people's experience of social flow in varying group music production tasks.

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## ACKNOWLEDGEMENTS

I would like to begin by thanking my fellow student investigator, Jason Keeler. His innovation, dedication, and openness to collaboration, were integral in bringing this project to fruition.

Professor Ed Roth, who served as my committee chair, has also been an invaluable asset to this project and my academic development. I would like to express my utmost appreciation for his insightful guidance throughout this research project as well as the past academic endeavors that have led me to this point in my career.

Thank you also to Professor Greg Jasperse, who did not hesitate to share his musical expertise and worked with the research team in creating song arrangements that best fit the needs of both the musicians and researchers.

In addition, I would like to express my gratitude toward the members of my thesis committee, Dr. David Smith and Dr. Ben Atchison, for their flexibility and words of encouragement throughout this process.

Lastly, thank you to all of my family and friends for their unwavering support, readiness to reassure, and inherent ability to provide comedic relief at all the right times.

Brittany L. Neuser

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## CHAPTER 1

### INTRODUCTION

#### *Statement of the Problem*

The World Health Organization defines health as “a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity” (World Health Organization, 1946). Achieving and maintaining health requires both the promotion of positive psychological states and the diagnosis and treatment of disorder or disease (Edwards & Cooper, 1988; Seligman & Csikszentmihalyi, 2000). One such positive psychological state, as identified by Mihaly Csikszentmihalyi in 1975, is flow (Csikszentmihalyi, 1975). The present research body indicates that flow, an optimal psychological state in which a person experiences efficient yet effortless execution of thoughts and action, is positively correlated with subjective well-being, self-perception, and positive affect (Engeser, 2012; Fritz & Avsec, 2007; Jackson et al., 2001; Moneta, 2004; Rogatko, 2009). Additionally, flow also holds the potential to facilitate social connection and increase the quality of interpersonal relationships when experienced in group settings – a phenomenon referred to as social flow (Csikszentmihalyi, 1997; Rathunde, 1997; Salanova et al., 2014). Ensemble musicians, both professional and amateur, frequently report feelings associated with social flow, stating that participating in group music experiences is a meaningful activity that cultivates a sense of belonging and social connectedness (Dingle, Brander, Ballantyne, & Baker, 2012; Judd & Pooley, 2014; Livesey et al., 2012). Though the present body of qualitative research indicates that group music production is

conducive to the social flow experience and can positively impact well-being, no experimental studies investigating the effects of varying structural elements of the musical task on social flow experiences were found. This paucity in experimental research indicates a need for pilot studies to help determine feasibility of procedures in investigating social flow in musical contexts (LaGasse, 2013).

### *Rationale for research*

Though the current body of literature indicates that group music-making holds the potential to facilitate social flow experiences, no experimental studies investigating the effect of varying structural elements of musical tasks on social flow experiences have been found. This study aimed to gather initial data and evaluate the feasibility of experimental research procedures in studying the experience of social flow in two different group vocal music production tasks: performance of a pre-composed piece and improvised performance. This initial data and establishment of experimental procedures could help future researchers develop studies that provide more detailed insight into the experience of social flow in group music making experiences, impacting the way that music is applied in both community and healthcare settings.

### *Research questions*

#### Research Question 1

Are the proposed experimental procedures feasible and effective in gathering flow state data in relation to group music production tasks?

#### Research Question 2

To what extent will social flow be experienced during a standard group vocal music performance task in a controlled, experimental setting?

#### Research Question 3

To what extent will social flow be experienced during a group vocal music improvisation task in a controlled, experimental setting?

#### Research Question 4

Will there be a difference in the level of social flow experienced during the standard group vocal music improvisation task as compared to the level of social flow experienced during the group vocal performance task?

#### *Definitions of terms*

Flow state is “the holistic sensation that people feel when they act with total involvement” (Csikszentmihalyi, 1975, p. 36). It is an optimal psychological state in which a person is able to act both efficiently and effortlessly. The flow experience is highly consistent across settings and is characterized by the following dimensions: Clear goals, unambiguous feedback, challenge-skills balance, concentration on the task at hand, merging of action and awareness, loss of self-consciousness, sense of control, transformation of time, and autotelic nature (Csikszentmihalyi, 1975).

Social flow is characterized by the same dimensions as individual flow state. However, it is distinct from flow state in that it is experienced in group settings and

involves optimal interaction in addition to optimal performance. Similar to flow state, social flow may occur in many diverse environments including athletic, occupational, educational and familial settings (Bakker, Oerlemans, Demoerouti, Slot, & Ali, 2011; Moon, 2003; Raphael, Bachen, & Hernández-Ramos, 2012; Snow 2010).

For the purposes of this study, standard group vocal performance is operationally defined as the performance of a song as it is written, without any improvisation or additional melodic or harmonic embellishments. Improvised group vocal performance is operationally defined as the performance of a song that is based on a pre-established melody and follows a syntactical harmonic structure, but incorporates melodic improvisation and embellishments. Improvisatory phrases based on the pre-established musical structure are exchanged between vocalists in a conversational manner.

### *Summary*

Achieving and maintaining an optimal state of health requires both the treatment of disease and the promotion of positive psychological states such as flow.

Flow is an optimal psychological state in which people find themselves able to think and act efficiently yet effortlessly. Social flow occurs when individuals within a group experience optimal interaction with one another. The present body of research indicates that group music production is conducive to social flow experiences. However, to date, no experimental studies examining the effect of varying structural elements of group music production tasks on social flow have been found. Establishing effective experimental procedures and gathering initial data on the experience of social flow during

vocal music production could impact the way music is applied in both community and healthcare settings.

## CHAPTER II

### REVIEW OF LITERATURE

#### *Flow*

Rock climbers risk their lives navigating novel routes and reaching new heights. Cyclists pedal through countless miles of pain and exhaustion. Surfers continually embrace the challenge of riding formidable ocean waves. Musicians devote their entire lives to their art form, occasionally at the expense of their livelihood. Some may wonder why these passionate people continue to climb, pedal, ride, and play despite an apparent lack of material rewards. It was this curiosity that led positive psychologist Mihaly Csikszentmihalyi to explore the motivation behind participation in activities for the pure sake of enjoyment (Csikszentmihalyi, 1975).

Csikszentmihalyi's initial investigations involved extensive interviews with amateur artists, mountain climbers, athletes, chess players, and surgeons. Though these subjects were diverse in respect to their pastimes of choice, they all possessed a similar motivation and willingness to participate in enjoyable activities with no concern for material rewards. Csikszentmihalyi focused his efforts on gaining insight into their apparent intrinsic motivation as well as other inner states of being that had not previously been extensively studied. His efforts led to the formation of flow theory, which he introduced in 1975 (Csikszentmihalyi, 1975; Csikszentmihalyi, 1997).

#### *Definition and dimensions of flow*

According to Csikszentmihalyi, to experience flow is to experience an optimal psychological state (1975). People experiencing flow find themselves completely

immersed in the present activity, so intensely focused that all unrelated thoughts and emotions seemingly disappear from their conscious being, allowing for efficient yet effortless execution of thoughts and actions. Autotelic in nature, the flow experience is both enjoyable and intrinsically rewarding (Csikszentmihalyi, 1975; Csikszentmihalyi, 1990; Engeser, 2012).

In his initial interviews, Csikszentmihalyi found that the experience of flow was highly consistent across environments. He identified common themes amongst all interview transcriptions and, using these themes, delineated nine dimensions of flow. The nine dimensions are further categorized into flow conditions and characteristics, as depicted in Table 1. Flow conditions serve as prerequisites that, when present, greatly increase the probability of a person entering flow. Alternatively, flow characteristics apply to the actual experience within the flow state (Csikszentmihalyi, 1975, Engeser, 2012; Jackson & Ecklund, 2002).

Table 1

*Flow Dimensions*

Flow Conditions	Flow Characteristics
Clear goals	Concentration on task at hand
Unambiguous feedback	Action-awareness merging
Challenge-skills balance	Loss of self-consciousness
	Sense of control
	Transformation of time
	Autotelic experience



Collectively, these dimensions characterize flow. However, each dimension also serves as a conceptual element of flow with its own unique construct (Csikszentmihalyi, 1990; Fritz & Avsec, 2007; Jackson & Marsh, 1996; Jackson and Csikszentmihalyi, 1999; Swann, Keegan, Piggott, & Crust, 2012):

*Clear Goals:* Knowledge of both the overarching goal or purpose of the activity as well as knowledge of the steps required to successfully achieve the overarching purpose helps focus thought and action, creating a higher potential for total absorption in the task at hand (Csikszentmihalyi, 1997).

*Unambiguous Feedback:* This flow condition is closely related to the construct of clear goals. Direct and immediate feedback regarding progress toward goals and the quality of performance decreases the need for self-reflection in the immediate moment, which in turn facilitates fluidity of action. The source of feedback may range from physical sensations felt within the performer to any number of external sources (Fritz & Avsec, 2007).

*Challenge-Skill Balance:* Perhaps the most critical and most widely researched flow condition involves a balance between skills required by a situation or task and the skills of the individual performing within that situation or task. Within the flow model, challenges are viewed as “opportunities for action” and skills are recognized as “action capabilities” (Csikszentmihalyi, 1975, p. 49). Tasks that appear too challenging in relation to an individual’s skill set result in anxiety while tasks that do not present enough challenge lead to boredom (Csikszentmihalyi, 1975; Engeser & Rheinberg, 2008).

*Concentration on the Task at Hand:* When in a flow state, no extraneous thoughts exist and distractibility is near impossible. The performer is completely focused on the present moment and connected to the task in such a way that the rest of the world seems to slip from the person's conscious mind (Fritz & Avsec, 2007).

*Action-Awareness Merging:* One of the most common subjective descriptions of flow experience is the feeling of effortless action—acting appropriately and efficiently without putting forth conscious cognitive effort in maintaining awareness of the situation (Csikszentmihalyi, 1975).

*Loss of Self-Consciousness:* Focus shifts completely to the present moment, allowing no thoughts of others' expectations or self-doubt to enter one's conscious (Jackson & Marsh, 1996; Csikszentmihalyi, 1997).

*Sense of Control:* Though absolute situational control does not exist, one feels in control and does not experience worry pertaining to any potential loss of control (Jackson & Marsh, 1996; Fritz & Avsec, 2007).

*Transformation of Time:* When experiencing flow, time may seem to pass slowly, quickly, or even stop. Each experience is unique and each person's perception different (Csikszentmihalyi, 1975).

*Autotelic Experience:* The term autotelic is comprised of the Greek “auto” (self) and “telos” (goal or purpose). An autotelic experience is one that is rewarding in and of itself. There is no other motivation outside of participation and enjoyment in the activity (Csikszentmihalyi, 1975).

Csikszentmihalyi states that these dimensions all contribute to the flow experience, which he further describes as “a *holistic* sensation that people feel when they act with total engagement” (1975, p. 36). While the concept of flow is similar to those of peak experience and peak performance in that all involve absorption, enjoyment, personal identity and involvement, it is unique in that its primary focus lies in the flow experience itself rather than an end goal or outcome (Privette, 1983). In addition, peak experiences typically tend to be more passive, while flow is an active experience in which a person is “attentively absorbed and skillfully engaged in an activity that [he or she] finds valuable” (Croom, 2012, p. 393; Keller & Bless, 2008).

*Flow as a continuum: Microflow and macroflow*

Csikszentmihalyi (1975) also clearly depicts flow as a continuum, a fluid state rather than a rigid construct. Though intense flow experiences are typically the most memorable and impactful, flow is also frequently experienced at a less intense level in everyday activities. This less intense flow experience is referred to as ‘microflow’ and is most likely to occur when completing simple, automatic acts such as doodling, watching television, preparing a simple meal, or even chewing gum.

Contrary to microflow, macroflow (also referred to as deep flow) results from “complex activities which require the full use of a person’s physical and intellectual potential” (Csikszentmihalyi, 1975, p. 54). Csikszentmihalyi examines activities such as playing chess, rock climbing, dancing, and performing surgery in exploring people’s experiences of deep flow. Both micro and macroflow hold potential to positively impact a person’s perceived life satisfaction and the level of flow experienced daily may depend

on factors such as psychological traits and intelligence (Ullén et al., 2012; Snyder & Lopez, 2005).

### *Outcomes of flow experiences*

Though the primary focus of flow lies in the experience itself, positive consequences of flow have been observed and studied across numerous settings including occupational, athletic, and educational environments. Outcomes of flow may vary across settings, but can include increased motivation, creativity, and overall efficacy in accomplishing tasks (Csikszentmihalyi & LeFevre, 1989; Custodero, 2002; Jackson, et al., 2001; Mugford, 2004; Salanova, et al., 2014; Schüler & Brunner, 2009). Research also supports the notion that flow holds great potential to influence quality of life and is positively correlated with subjective well-being, self-perception, and positive affect in people from different cultures, age-groups, and socio-economic classes (Bruya, 2010; Engeser, 2012; Fave & Massimini, 2004; Fritz & Avsec, 2007; Jackson et al., 2001; Moneta, 2004; Rogatko, 2009; Seo, 2011). Asakawa (2010) examined the well-being of Japanese college students as it pertained to the frequency of flow in their daily lives using the Experience Sampling Method (Csikszentmihalyi & Larson, 1987). It was found that students who experienced flow regularly did not only display higher levels of self-esteem and fulfillment, but were also more likely to employ active coping strategies when faced with challenges. Some of this satisfaction may stem from the inherent personal growth opportunities in repeated flow experiences (Moneta, 2004). In order to continually experience flow, an appropriate balance between challenge of the task and skills of an individual must be maintained. As one's skill level increases, so must the challenge of the

task, which then provides opportunities to further develop the skillset and gain confidence in the performance of that skill. For example, a rock climber may find that, after repeatedly climbing the same route, the climb does not provide the same satisfaction that it did when he or she first successfully completed it. At this point, the climber is likely to seek out a new route that presents novel challenges in an effort to regain his or her sense of accomplishment and personal fulfillment (Csikszentmihalyi, 1975; Darity, 2008; Engeser, 2012).

### *Social flow*

In recent years, researchers have expressed a growing interest in the concept of social flow (Engeser, 2012). The distinction between solitary and social flow is simple in that flow may be experienced in both individual or group contexts. Though the experiences are similar, social flow involves not only optimal performance, but also optimal interaction between two or more people (Bachen & Raphael, 2011; Csikszentmihalyi, 1975, 1997). Csikszentmihalyi initially introduced the concept of social flow after studying the behaviors and flow experiences of people dancing to rock music. In social situations, challenges may be personal or interpersonal in nature. For example, when dancing in a group setting a person must move to the beat of the music individually and also coordinate his or her movements with a partner or other people around him or her (Csikszentmihalyi, 1975). More recently, social flow has been studied in various contexts including athletic, occupational, academic, and familial environments (Bakker, Oerlemans, Demoerouti, Slot, & Ali, 2011; Nielsen & Cleal, 2010; Moon, 2003; Raphael, Bachen, & Hernández-Ramos, 2012; Snow 2010). Though none of these areas

have been extensively researched, the literature currently suggests that frequency of social flow experience is positively correlated with the quality of interpersonal relationships as well as individual and group outcomes (Aubé, Brunelle, & Rosseau, 2014; Delle Fave & Bassi, 2009; Bakker et al., 2011; Rathunde, 1997; Salanova et al., 2014).

### *Social coordination*

Social flow, which involves optimal interpersonal interaction, is highly dependent upon social coordination. Social coordination, or the synchronization of thoughts and actions of two or more people based on socially transmitted information, occurs at both conscious and subconscious levels and may manifest physiologically, psychologically, or behaviorally. In complex tasks such as playing a team sport, social coordination is achieved through intensive training and repetitive practice. Alternatively, coordination of conversational turns between two people typically happens without exertion of extensive effort (Bruya, 2010).

The present body of research points towards three primary means of reaching social coordination. The first of which is the mutual existence of two or more people in a dynamical system, or the sharing of external or internal changes between two people (Bruya, 2010). These shared changes affect each individual's performance, molding and shaping actions in order to reach and maintain a state of synchrony. Walker (2010) explored flow within a dynamical system in which the level of social interdependence in a racket sport game was manipulated. In the low-interdependent condition two players were instructed to volley cooperatively, with one person on each side of the net. In the

high-interdependent condition, players were placed in teams of two and instructed to pass the ball to each other before volleying over the net to the other team. Behavioral and self-report data indicated that the high-interdependent task was more challenging, but also more enjoyable. In addition, participants reported a more intense flow state when participating in the high-interdependent task as compared to the low-interdependent task. Based on these results, it may be proposed that the inherent level of interdependence within a dynamical system influences the extent to which social coordination and, therefore, social flow will be achieved.

The second component of social coordination involves a neural perception-action link, which implicates that when a person watches, listens to, or imagines a physical activity or emotional response, the brain regions associated with actually partaking in the experience will activate (Bruya, 2010). The perception-action link plays a direct role in emotional contagion, a phenomenon in which a person is likely to adopt the moods and emotional states of the people around him or her. Emotional contagion has also been identified as a potential contributing factor in social flow (Bakker, 2005; Hatfield, Cacioppo, & Rapson, 1993). In other words, if one person in a pair or group is in flow state, it is likely that flow will cross over from that person to those around him or her, increasing the level of social flow. Bakker (2005) investigated this phenomenon in music teachers and their students. He found a positive correlation between the frequency of music teachers' flow and the flow of their respective students, providing one of the first demonstrations of the crossover of positive emotions in field research.

Social coordination is also influenced by active motivations. Establishing a goal in which coordination either is the outcome or is necessary in reaching the desired

outcome impacts the extent to which people will intentionally display cooperation and synchronize (Bruya, 2010). It is noteworthy that the establishment of clear goals is also identified as a contributing factor in individual flow experiences (Csikszentmihalyi, 1975). Active motivations may stem from external influences such as a coach or parent. They may also be more intrinsic in nature. For example, the affiliation-intimacy motive is a “recurrent preference or readiness for experiences of close, warm, and communicative exchange with others— interpersonal interaction that is seen by the interactants as an end in itself, rather than a means to another end” (McAdams 1984, p. 45). Individuals who possess high affiliation-intimacy motive may be more likely to enter flow states in social situations, as they are intrinsically motivated to establish social coordination and foster meaningful relationships with others (Engeser, 2012; Bruya, 2010).

### *Music and social flow*

Musicians—professionals, amateurs, and students—frequently report feelings associated with social flow and state that participating in music ensembles is a meaningful activity that cultivates a sense of belonging and social connectedness (Hart & Di Blasi, 2015; Judd & Pooley, 2014; Livesey et al., 2012; O’Neill, 1999; Sinnamon, Moran, & O’Connell, 2012). Group music experiences such as , including those involving group singing, hold potential to elicit similar responses and positively impact non-musicians well. Adults with chronic mental illness, people with Parkinson’s disease and other neurological conditions, and females with eating disorders have all reported perceived personal and interpersonal benefits of group singing (Beutow, Talmage, McCann, Fogg, & Purdy, 2014; Pavlakou, 2009; Talmage, Ludlam, Leao, Fogg-Rogers,



& Purdy, 2013). In order to gain a better understanding of the experience of social flow within group music tasks, one must first explore flow as it relates to music in general.

### *Flow and music listening*

Music listening serves as a common pastime amongst many diverse people. Music can be broadly defined as organized auditory stimulus. It is this organization and element of relative predictability that can minimize anxiety, allowing a person to transition into flow during music listening (Meyer, 1956; Margulis, 2005). Simultaneously, the diversity of instrumentation, rhythmic patterns, harmonic construction, and other elements of music prevent boredom when listening. These characteristics of music contribute to its potential to induce flow experiences (Csikszentmihalyi, 1990). Attention-related elements such as the level of concentration exhibited by the listener and the quantity of distractors present during listening directly impact the intensity of flow during music listening (Diaz 2011).

Music listening, specifically listening to recorded music, is a relatively passive experience whereas music composition, songwriting, and performance are active experiences. This distinction is important, as flow experiences are most frequently active in nature (Keller & Bless, 2008). Though the research base remains relatively limited, researchers have provided initial evidence supporting the proposal that active music experiences hold potential to induce flow and the idea that relationships between flow and other components of these experiences such as quality of output, creativity, and personal satisfaction with the musical product exist.

### *Flow and music composition*

Though it is guided by concrete concepts of music theory, music composition is a creative process. While music educators may be able to objectively assess technical components of music composition, objectively assessing the creative quality of student work proves to be more challenging. This challenge of objectively assessing creativity motivated Byrne (2006) to investigate the effectiveness of using flow as an assessment tool in grading creativity of student group compositions. The experience sampling form (Csikszentmihalyi & Csikszentmihalyi, 1988) served as the primary measure of self-reported flow. Students completed this form after each collaborative composing experience and university staff rated the level of creativity in each completed composition using a criteria-based, numerical scoring method. Significant positive correlations were found between self-report flow scores and creativity ratings, supporting the idea that higher levels of flow are associated with higher levels of creativity.

Baker and MacDonald (2013) approached this matter of creativity and composition with a slightly different perspective, examining the extent to which flow was exhibited in various song creation conditions and the outcomes of those experiences. Participants, who consisted of university students (n=15) and retirees (n=15), each completed lyric creation, original songwriting, and a song parody task with the aid of a trained music therapist in this within-subjects study. In addition to measuring flow in individual therapeutic songwriting experiences using the Short Flow Scale and Core Dispositional Flow Scale (Martin & Jackson, 2008), Baker and MacDonald developed a Song Process and Product Questionnaire (SPPQ). The questionnaire was designed to assess song ownership, sense of achievement, personal identity, collective identity,

sharing personal thoughts and feelings, and satisfaction. Results indicated a statistically significant positive correlation between overall SPPQ scores and each of the flow measures across three different songwriting conditions. Additionally, flow measure outcomes were compared with those from previously published studies examining flow experience in team sports, music performance, and work environments. It was found that song creation generally possesses higher core dispositional flow than other tasks, including music performance, providing preliminary support for the notion that songwriting tasks are more apt to induce flow state than other tasks requiring less creative output.

#### *Flow and music performance*

Differences in core dispositional flow between songwriting and music performance may also stem from differences in situational pressure and performance anxiety, as briefly discussed by Wrigley and Emmerson (2013), who examined the experience of flow in live music performance. Participants (N=236) consisted of undergraduate and postgraduate music performance students who completed the Flow State Scale immediately following a 20-45 minute performance examination. Because performances were graded, participants may have experienced increased levels of anxiety, inhibiting their ability to enter a flow state. That being said, most participants did report some level of flow regardless of academic standing, gender, or instrument family, which is consistent with findings that suggested that student musicians of both amateur and elite status frequently experience flow (Sinnamon, Moran, & O'Connell, 2012). The intensity of flow may have also been affected by each individual's trait emotional

intelligence and the emotional content of the composition played (Marin & Bhattacharya, 2013). This study was the first to directly address the experience of flow in live music performance, providing empirical evidence for the validity and reliability of the Flow State Scale in this unique context.

### *Social flow and music improvisation*

It was previously mentioned that social flow is frequently experienced in music ensembles. After examining the literature regarding flow and music tasks, it appears that music improvisation may hold great potential in facilitating even deeper social flow experiences than standard performance of pre-composed music. Music improvisation is a unique and creative active music experience that involves elements of music listening, composition, and performance. In music improvisation, immediate auditory feedback influences musicians' moment-to-moment decisions as they work toward the goal of creating an engaging and aesthetically pleasing sound, often in a group setting. The process allows musicians to embrace the challenge of innovating within an established musical structure, effectively utilizing both their technical competence and artistic instinct (Rogers, 2013; Sawyer, 2006). In fact, the concept of music improvisation greatly resembles that of rock dancing, as addressed by Csikszentmihalyi (1975) who states that "rock dance is improvisational rather than choreographic...composed of individually created segments or of more standard dance steps performed in random sequence" (p. 103).

Additionally, the current literature base brings to light some commonalities in the potential underlying neurophysiological substrates of flow and of music improvisation

experiences. In his 2004 publication, Dietrich proposed that transient hypofrontality, or the temporary diminishing of neural activity in the pre-frontal cortex, underlies the flow experience. More specifically, he states that transient hypofrontality is a prerequisite for flow, as it suppresses analytical and reflective functions that typically inhibit flow. In their 2008 neuroimaging study, Limb and Braun found that, when engaged in improvisation, male jazz musicians between the ages of 21 and 50 years demonstrated a deactivation of prefrontal cortex structures that typically mediate self-monitoring. This transient hypofrontality was accompanied by the deactivation of limbic structures that primarily function to regulate motivation and emotion. Though more research is needed in both of these areas, it appears that similar neural patterns underlie both flow and creative music experiences, further supporting the notion that group music improvisation may facilitate social flow experiences.

Group music improvisation also inherently possesses the three aforementioned routes to social coordination: Dynamical systems, the perception-action link, and active motivations (Bruya, 2010). When making music together people function within a dynamic musical structure, listening to and reacting to each other, with the shared goal of creating a cohesive and aesthetically pleasing sound (Hytönen-Ng, 2013; Seddon, 2005). The merging of these three means of achieving social coordination in group music production frequently results in interactional synchrony, which is defined as a state in which “each of the group members can even feel as if they are able to anticipate what their fellow performers will do before they do it” (Sawyer, 2006).

Presently, the research involving social flow during improvisation consists of qualitative interviews with jazz musicians and focuses on individual rather than group

flow (Engeser, 2012; Hart & DiBlasi, 2015; Hytönen-Ng, 2013). Within these interviews, professional jazz musicians consistently describe the process of “finding the groove” and feeling the merging of individuals into a single working entity. Their reports align with Csikszentmihalyi’s original descriptions of optimal interaction within social flow as well as previous reports involving the positive outcomes of social flow, as the merging of individual actions and sounds seems to result in a perceived increase in empathy between musicians and a strong sense of trust and support amongst group members (Csikszentmihalyi, 1975; Hart & Di Blasi, 2015; Hytönen-Ng, 2013; MacDonald & Wilson, 2014; Sutton, 2004).

### *Summary*

Flow is an optimal psychological state and intrinsically rewarding experience that is characterized by complete concentration on a task, the merging of action and awareness, a loss of self-consciousness, sense of control, and transformation of time. Flow is positively correlated with perceived quality of life and when experienced in group settings, it may also help facilitate the development of interpersonal relationships. Though the present research base indicates that participation in music ensembles, particularly those involving group singing, and music improvisation are conducive to facilitating social flow experiences in both amateur and professional environments, no experimental studies investigating the effects of varying structures of music performance tasks were found. Establishing effective experimental procedures and gathering initial data on the experience of social flow during various vocal music production could

eventually impact the way music is applied in both community and healthcare settings to promote positive psychological states and facilitate social connection.

## CHAPTER III

### METHOD

#### *Participants: Recruitment, enrollment, and demographics*

Vocal jazz students at Western Michigan University were recruited for this study using flyers that were created by a member of the research team and disseminated by the director of WMU's vocal jazz ensembles at the conclusion of a regular group rehearsal (Appendix A). The vocal jazz director was also provided with a script and instructed to read it prior to distributing the flyers (Appendix B). Because the primary focus of this study was to determine feasibility of experimental research procedures, the experimenters aimed to recruit four participants from the pool of approximately thirty-two students.

During the recruitment process, potential participants were instructed to express an interest in the study by contacting the investigators via the phone numbers or email addresses listed on the recruitment flyer. The student investigators responded to participant inquiries via phone or email using a script, which was approved by WMU's Human Subjects Institutional Review Board and arranged for an individual consent review and signing meeting with each participant. If, after reviewing the WMU Human Subjects Institutional Review Board consent forms, a participant felt that they were qualified and wished to join the study, the student investigator also collected scheduling information.

At the conclusion of the recruitment period two female and three male participants, all members of the same university vocal ensemble, were enrolled in the study. All participants were jazz vocalists, students at Western Michigan University, and over the age of 18 years. Because a second component of this experiment, planned and



implemented by a second student investigator, involved the drawing of blood to measure neurochemical secretion during each task, each participant was provided with a list of exclusion criteria and self-screened during the informed consent process. The presence of one or more of the following conditions or behaviors resulted in disqualification from participation: medical or psychiatric illness, smoking more than 15 cigarettes per day, drug or alcohol abuse, weighing less than 110 lbs, bleeding disorders (e.g. hemophilia), and pregnancy. All enrolled subjects met the inclusion criteria.

### *Research design*

A post-test only by condition, within subjects design using one factor with two levels as the predictor variable (standard music performance vs. improvised music performance) was employed in this study. This design was chosen to compare the mean outcomes of experiences of social flow using the Flow State Scale-2 General (Jackson, Eklund, & Martin, 2010) as the outcome variable.

### *Standard and improvised performance conditions*

All musical decisions were made in collaboration with WMU's vocal jazz director, who was familiar with the participants' skill level and repertoire and made recommendations accordingly. The director assured that all participants had prior experience rehearsing with and performing in vocal jazz ensembles and were accustomed to singing pieces similar to those used in this study, which helped facilitate the rapid learning of the musical content directly prior to each condition. The jazz standard "Centerpiece" (Edison & Hendricks, 1958) served as the musical content for both the

standard and improvised conditions. The vocal jazz director created two vocal quartet arrangements of the piece, one for the standard performance condition (SP) and one for the improvised performance condition (IP). The SP arrangement was to be sung as written, with no improvisation embellishments. The IP arrangement started with the unison singing of the original melody and then allowed time for each participant within the group to improvise over the basic harmonic structure of the original song. Prior to the onset of each condition, the participants were provided with brief instruction lasting between 4 and 5 minutes. Immediately following the instructional period, the participants performed either the SP or IP arrangement. The duration of the SP condition was 5 min., 38 sec. The duration of the IP condition was 6 min., 1 sec.

### *Outcome measure*

Following each condition, participants individually completed the Flow State Scale-2 (FSS-2; Jackson, Eklund, & Martin, 2010), a 36-item questionnaire that assesses individual's perceived level of flow within a specific event (Appendix C). The FSS-2 is a post-event assessment and, as such, should be administered as soon as possible following participation in the activity in question.

The 36 items (questions) in the FSS-2 reflect Csikszentmihalyi's definition of flow, with 4 items directly addressing each of the following nine flow dimensions: Challenge-skill balance, merging of action and awareness, clear goals, unambiguous feedback, concentration on the task at hand, sense of control, loss of self-consciousness, transformation of time, and autotelic experience. Participants were directed to respond to each statement using a 5-point Likert scale in which a score of 1 indicated "Strongly

Disagree,” a score of 3 indicated “Neither Agree nor Disagree,” and a score of 5 indicated “Strongly Agree.” For the purposes of this study, scores were categorized as ‘no flow’ (score of 1), ‘low/moderate flow’ (score of 2 or 3), and ‘high flow’ (score of 4 or 5). This categorization was based on the methods used by Wrigley and Emmerson (2013).

The FSS-2 is scored by first calculating the total raw score for each dimension. Each raw dimension score is then divided by 4 to compute the average dimension score. The sum of all average dimension scores provides the total scale score. The maximum total scale score of 45 signifies the ultimate flow experience. The minimum total scale score of 9 signifies no flow. The FSS-2 has demonstrated strong construct validity and reliability across various physical activities including yoga, basketball, soccer, running, and football (Jackson & Eklund, 2002; Jackson, Martin, & Eklund, 2008). The FSS-2 has also been shown to be valid and reliable in measuring flow during live music performance, with Cronbach’s alpha ranging from .81 to .92 for each of the nine dimensions (Wrigley & Emmerson, 2013).

### *Procedure*

Upon arrival to the study location, participants were invited to sit down in the performance area and the investigators verified that each participant had previously participated in an individual consent meeting and signed a consent form. The investigators verbally reviewed the research protocol and provided participants with an opportunity to ask questions. One participant was identified as an alternate and instructed to sit behind a two-way mirror where he could observe the group performances, but

would not participate in the research procedures unless needed due to another participant's last-minute decision not to participate. The investigators guided the remaining four participants through the research procedures, which included procedures intended to gather feasibility data for both this thesis project and a second student's thesis project.

The four participants were first instructed to enter a separate room in pairs, where two phlebotomists conducted individual pre-test blood draws. Following this procedure, participants were directed back to the meeting area where they completed the standard performance condition. Within this condition, the vocal jazz director provided participants with sheet music and conducted a brief overview and rehearsal of the musical roadmap, which lasted 4 minutes. Following the brief instruction, participants sang the song as written, with no improvisation or embellishments. The duration of the performance was 5 min., 38 sec. At the conclusion of the performance, participants were guided back to a nearby but separate room in pairs, where two phlebotomists conducted individual post-test blood draws. The phlebotomists and members of the research team asked each participant if they were feeling well enough to move to the next phase of the study. All participants confirmed that they were able to proceed with no ill effects from the blood draw. As participants exited the blood draw room, they were provided with a paper copy of the FSS-2 and a pencil. An investigator then led each participant to a nearby and isolated area where they were instructed to complete the FSS-2 according to the directions located at the top of the test-page and upon completion of the survey, take time to rest before completing the second performance. Thirty minutes were provided to take the test, rest a bit, and function as a washout period prior to pre-test blood draws for

the second musical condition. At the end of the 30-minute test-and-rest period, the investigators guided each participant back to the performance area. The procedures, beginning with a pre-test blood draw, were then repeated for the improvised performance. The improvised performance condition was conducted as described earlier in this paper, with the overview and instruction period lasting 4 minutes and the performance lasting for 6 min., 1 sec. Following the improvised condition, participants were lead again in pairs for the post-test blood draw, followed by a second administration of the FSS-2. After the completion of the second FSS-2, the researchers conducted a debriefing session in which they thanked the participants for their time and invited the participants to voice questions or provide feedback.

#### *Analysis of the data*

A post-test only by condition, within subjects design using one factor with two levels as the predictor variable (standard music performance vs. improvised music performance) was employed in this study. This design was chosen to compare the mean outcomes of experiences of social flow using the Long Flow State Scale-2 General (Jackson, Eklund, & Martin, 2010) as the outcome variable. The primary purpose of this study was to evaluate the feasibility of our ability to recruit, enroll, and implement the study's procedures, as well as provide a cursory review of the experimental outcomes. A small sample of four participants with one alternate was enrolled in the study enabling us to determine the feasibility within fiscal and time restraints prior to moving forward with a larger study. As such, the study was insufficiently powered, negating the use of statistical analyses. If it were sufficiently powered, the Wilcoxon signed ranks test would

be employed to compare the mean total scale outcomes of the FSS-2 between conditions as well as the mean scores for each flow dimension between conditions.

## CHAPTER IV

## RESULTS

*FSS-2 descriptive statistics*

Raw FSS-2 scores indicate that participants experienced social flow in both the standard and improvised conditions. The mean total scaled score in the SP condition, with a maximum possible score of 45, was 37.06 (n=4). The mean total scaled score in the IP condition, with a maximum possible score of 45, was 34.25 (n=4). Mean scores for each dimension of flow for the SP and IP conditions are displayed in Table 2.

Table 2

*FSS-2 Dimension Scores in Standard and Improvised Conditions*

Standard Performance					
FSS-2 Dimension Subscale	n	Minimum	Maximum	Mean	Std. Deviation
Challenge-Skills Balance	4	3.25	4.00	3.69	0.31
Merging Action-Awareness	4	3.75	4.50	4.18	0.31
Clear Goals	4	3.75	4.75	4.18	0.43
Unambiguous Feedback	4	3.75	4.75	3.56	0.66
Concentration on the Task	4	3.25	4.25	3.94	0.47
Sense of Control	4	4.00	5.00	4.63	0.43
Loss of Self Consciousness	4	3.25	4.50	3.88	0.52
Transformation of Time	4	3.25	4.50	3.69	0.59
Autotelic Experience	4	3.25	5.00	4.44	0.83
Improvised Performance					
FSS-2 Dimension Subscale	n	Minimum	Maximum	Mean	Std. Deviation
Challenge-Skills Balance	4	3.50	5.00	4.44	0.66
Merging Action-Awareness	4	2.50	5.00	3.44	1.13
Clear Goals	4	2.50	4.25	3.44	0.72
Unambiguous Feedback	4	3.00	4.25	3.56	0.66
Concentration on the Task	4	4.25	5.00	4.56	0.31
Sense of Control	4	3.75	4.00	3.94	0.12
Loss of Self Consciousness	4	2.00	3.50	2.56	0.66
Transformation of Time	4	3.25	4.50	3.69	0.55
Autotelic Experience	4	4.25	5.00	4.69	0.38

It is noted that the ratings of the following dimensions were 1.25 points higher in the SP than in the IP condition: merging of action and awareness, clear goals, and loss of self-consciousness. Alternatively, the ratings of concentration on the task and autotelic experience were 1 point lower in the SP than in the IP condition.

#### *Research question 1*

“Are the proposed experimental procedures feasible and effective in gathering flow state data in relation to group music production tasks?”

The proposed experimental procedures were implemented successfully. The procedures were effective in gathering flow state data regarding group music production tasks as indicated by FSS-2 scores and participant feedback, which included statements that indicated high comfort levels in the experimental setting.

#### *Research question 2*

“To what extent will social flow be experienced during a standard group vocal music performance task in a controlled, experimental setting?”

The results indicate that moderately high levels of social flow ( $M = 37.06$  with a minimum possible score of 9 and maximum possible score of 45) were experienced during a standard group vocal music performance task in a controlled, experimental setting.



*Research question 3*

“To what extent will social flow be experienced during a group vocal music improvisation task in a controlled, experimental setting?”

The results indicate that moderate levels of social flow ( $M = 34.25$  with a minimum possible score of 9 and maximum possible score of 45) were experienced during a group vocal music improvisation task in a controlled, experimental setting.

*Research question 4*

“Will there be a difference in the level of social flow experienced during the standard group vocal music improvisation task as compared to the level of social flow experienced during the group vocal performance task?”

A small difference in mean scores exists between the conditions (SP  $M = 37.06$  vs. IP  $M = 34.25$ ). Statistical analyses were not employed to determine significance due to the small sample.

## CHAPTER V

### DISCUSSION

#### *Experimental manipulation of social flow*

Social flow was experienced in both the standard and improvised conditions, providing support for the use of experimental procedures in studying social flow during group music production tasks. Raw scores also indicate that the experience of flow was slightly greater during the standard performance than in the improvised performance. Previous research has found that creative demand within a task is positively correlated with intensity of flow (Baker & MacDonald, 2013). In the present study, the improvisation task was structured in a way that required more creative input than the standard performance, but did not appear to facilitate deeper flow experiences.

One particular dimension of flow, loss of self-consciousness, appeared to contribute most to the difference in flow experience between conditions as the mean dimension score was 1.32 points lower on the 5-point Likert scale during improvisation than during standard performance. This observation aligns with the findings of Wrigley and Emmerson (2013), who found that the loss of self-consciousness dimension received the lowest mean score in comparison to the other eight flow dimensions in undergraduate vocal students. While the creative demands in improvisation tasks may appear more conducive to social flow from a challenge-skills perspective, it must also be recognized that creative output in group settings requires a certain level of self-disclosure amongst group members, which may elicit anxiety and inhibit flow.

In addition to the increased levels of self-disclosure in improvisation, the participants' level of flow may have been affected by their skill level and past musical

experiences. For example, one participant, during debriefing discussion, mentioned that she did not improvise as frequently as the other participants and she felt unsure of herself. However, when presented with a follow up question, she stated that she did not feel as anxious in this setting as in past experiences. This may be, in part, because participants were repeatedly told that the researchers primary focus was on the nonmusical components rather than the quality of the musical product.

Another participant mentioned that he found himself having to put forth more effort during the improvisation, stating, “When it was spontaneous, I actually had to do a lot more thinking.” This statement conflicts with previous reports of professional jazz musicians, who state that when they are improvising they frequently get “in the musical zone” and actions and sounds seem to naturally occur with little felt effort. Some professionals also describe their most memorable improvisation experiences as being surreal (Hytönen-Ng, 2013). This inconsistency between studies sheds light on the importance of accounting for the skill level and past experiences of musicians, as the experiences of student musicians such as those who participated in this study, may differ from those of professional and more experienced musicians.

### *Feasibility of experimental procedures*

Most experimental research investigating flow has employed the use of video games, as the researchers could easily manipulate the difficulty level of the game to best match each participant’s skill level (Keller & Bless, 2008; Keller & Blomann, 2008). Consequently, most experimental research has focused on the facilitation of flow through manipulation of the challenge-skills balance and little attention has been given to the

effect of task structure on flow experience. This study aimed to provide evidence for potential expansion of flow research methods and evaluate the feasibility of research procedures in studying social flow during different types group music production tasks.

Researchers are also gaining interest in the physiological and neural substrates of flow. The larger study in which this one was embedded, involved the drawing of blood immediately preceding and following each condition. Though this could be viewed as a confounding variable, as a blood draw occurred in between the completion of the task and the distribution of the FSS-2, the inclusion of this element also allowed the researchers to assess the feasibility of simultaneously gathering self-report and neurochemical data in studying flow during music production. Based on participant responses during the debriefing period, the procedures were effective in facilitating flow for student musicians and the blood draw did not appear to affect the subjective reports of flow. It is also important to acknowledge that seven out of the eight flow scales were administered within 15 minutes of the end of the task in question, as it is recommended that the FSS-2 be administered as soon as possible following participation in the activity being assessed (Jackson, 2009).

### *Quantitative measures of flow*

As in any research involving subjective psychological states, researchers must remain sensitive to the individual experience and avoid placing too much weight on empirical measures of flow (Jackson & Eklund, 2002). While the FSS-2 has demonstrated reliability and validity in live music performance context, it does not account for potential unequal contributions of each flow dimension to each individual's

flow experience. For this reason, it is recommended that quantitative measures such as the FSS-2 be used in conjunction with subjective reports obtained through post-performance semi-structured interviews to aid researchers in acquiring more comprehensive flow reports. Flow is a multi-faceted state that is best identified through a broad set of measures (Ainley, Enger, & Kennedy, 2008).

### *Limitations*

Prior to conducting the study, participants were informed that the researchers were investigating differences between standard and improvised performance. This knowledge may have influenced responses either during or following each task.

Additionally, the researchers did not screen participants for improvisatory ability or experience. Skill and comfort levels may have positively or negatively influenced the participants' confidence, which could either facilitate or impede flow experiences. Similarly, the presence of the vocal jazz director during the performances could result in increased self-consciousness, which would impede flow experiences.

This study also did not account for order effect. Future researchers may consider using a design with counterbalancing to help control for order effect.

### *Recommendations for future research*

This study provided support for the feasibility of conducting experimental flow research in which the structure of a musical task is manipulated. Because the present study involved a very small sample, it is recommended that a study be conducted with a

larger sample size to further evaluate the experimental procedures and to gain sufficient power that would allow for statistical analysis of results.

It is also recommended that future research account for the effect of various personality traits on proneness to flow. For example, it has been observed that perfectionist tendencies frequently inhibit flow (Bruya, 2010; Teng, 2011). With a small sample size, personality traits could drastically influence individual and, therefore, social flow data. Screening participants with a personality inventory could prove helpful in accounting for such differences and allow for comparisons of flow experience of individuals with varying personality traits.

It has been proposed that flow-inducing activities may also benefit clinical populations such as women undergoing cancer treatment and people with chronic pain (Reynolds & Prior, 2006; Robinson, Kennedy, & Harmon, 2012). Future researchers may also consider structuring the music production tasks in a way that more accurately reflects the current practices of music therapists, who employ the clinical use of music improvisation in dyadic and group settings to facilitate positive social interactions and elicit desired nonmusical responses (MacDonald & Wilson, 2014). For example, many clinical experiences entail the playing of instruments as opposed to singing. Clinicians may also manipulate instruments in such a way that clients, despite age or ability, are able to participate in an error-free music-making experience (improvising modally, for example) that results in the creation of an aesthetically pleasing sound. Collaboration between practicing clinicians and researchers will prove vital in progressing this line of research and gaining more insight into the facilitation, experience, and outcomes of social flow in the context of group music-making.

## APPENDIX A

## Recruitment Flyer

# SING FOR SCIENCE!

## A GRADUATE RESEARCH STUDY



You are invited to participate in a research study exploring singing and social bonding. We are interested in the biology of social connectedness experienced during singing.

**Who is eligible?**

- Must be a jazz vocalist and student at WMU
- Must be over 18 years old

**What will you be asked to do?**

- Sing and improvise in a vocal jazz quartet
- Have blood drawn and complete two questionnaires
- Approximately 2 hour time commitment

Compensation: Each participant will receive a \$50 Amazon.com gift card

**To learn more,** contact one of the student investigators of this study, Jason Keeler or Brittany Neuser, at [jason.r.keeler@wmich.edu](mailto:jason.r.keeler@wmich.edu), [brittany.l.neuser@wmich.edu](mailto:brittany.l.neuser@wmich.edu), or (269) 387-8841.

Western Michigan University  
BRAIN Lab



## APPENDIX B

### Recruitment Script

Verbally presented by the vocal jazz director:

“Our colleagues in Music Therapy are conducting a study that will investigate the neurochemistry of singing, including improvising vocally. If you are interested in participating or finding out more about the study, their contact information is on the flyer and you are invited to call or e-mail some time in the next week.”



## APPENDIX C

## Sample Flow State Scale-2 Questions (Jackson, Eklund, &amp; Martin, 2010)

Dimension Assessed	FSS-2 Statement
Challenge-Skills Balance	I was challenged, but I believed my skills would allow me to meet the challenge.
Unambiguous Feedback	It was really clear to me that I was doing well.
Loss of Self-Consciousness	I was not concerned about what others may have been thinking of me.
Merging Action-Awareness	I did things spontaneously and automatically without having to think.
Autotelic Experience	I loved the feeling of that performance and want to capture it again.

## APPENDIX D

## HSIRB Approval

WESTERN MICHIGAN UNIVERSITY



Human Subjects Institutional Review Board

Date: March 20, 2015

To: Ed Roth, Principal Investigator  
Jason Keeler, Student Investigator for Thesis  
Brittany Neuser, Student Investigator for Thesis

From: Amy Naugle, Ph.D., Chair

Re: HSIRB Project Number 14-11-23

This letter will serve as confirmation that the changes to your research project titled "Neurochemistry of Singing: Social Bonding and Oxytocin" requested in your memo received March 20, 2015 (to increase number of participants from four to six) have been approved by the Human Subjects Institutional Review Board.

The conditions and the duration of this approval are specified in the Policies of Western Michigan University.\*

Please note that you may **only** conduct this research exactly in the form it was approved. You must seek specific board approval for any changes in this project. You must also seek reapproval if the project extends beyond the termination date noted below. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

The Board wishes you success in the pursuit of your research goals.

**Approval Termination: December 21, 2015**

## APPENDIX E

### HSIRB Consent Letter

#### **Western Michigan University School of Music**

**Principal Investigator:** Edward Roth, MM, MT-BC  
**Student Investigator:** Jason Keeler, MT-BC  
**Student Investigator:** Brittany Neuser, MT-BC  
**Title of Study:** Neurochemistry of Singing: Social Bonding and Oxytocin

You have been invited to participate in a research project titled "The neurochemistry of singing: Oxytocin and social bonding." This project will serve as Jason Keeler and Brittany Neuser's theses for the requirements of the Master's of Music. This consent document will explain the purpose of this research project and will go over all of the time commitments, the procedures used in the study, and the risks and benefits of participating in this research project. Please read this consent form carefully and completely and please ask any questions if you need more clarification.

#### **What are we trying to find out in this study?**

The purpose of the present study is to examine the effects of vocal improvisation on biological measures of trust and social bonding. People often report feelings of unity or connectedness during group music experiences, however, little is known about the neurotransmission processes that facilitate these experiences. This study will examine oxytocin and adrenocorticotrophic hormone, which are associated with feelings of social bonding often experienced during group singing. Also, musicians often report experiencing a mental state known as "flow" while performing music. You will be asked to complete a written survey that will help us assess the level of flow you may have experienced while singing during this experiment.

#### **Who can participate in this study?**

To be able to participate in this research project, you must meet the following criteria:

- You must be over the age of 18.
- You must not have a significant medical or psychiatric illness, smoke more than 15 cigarettes per day, abuse drugs or alcohol, have any bleeding disorders (e.g. hemophilia), weigh less than 110 lbs, or be pregnant.
- Participants must be jazz vocalists with the ability to improvise vocally.

#### **Where will this study take place?**

Study procedures and data collection will take place in the music therapy clinic, room 3025, located on the third level of the Dalton Center on Western Michigan University's main campus.

### **What is the time commitment for participating in this study?**

The total time commitment for this study is approximately two hours.

- Read and sign consent form prior to the day of study procedures: 10 minutes
- Study procedures: 110 minutes

### **What will you be asked to do if you choose to participate in this study?**

During this study, you will be asked to sing in a jazz quartet with three other participants. You will be asked to sing two times, once from a score as the music was originally written and a second time with extensive improvisation using the same score. Prior to, and immediately following each singing condition, you will be asked to have your blood drawn by a trained phlebotomist, for a total of four blood draws. You will be asked to fill out two surveys during this study.

The student investigator will call you 48 hours prior to the experiment to remind you about the time and location of the study.

When you arrive for the experiment, the student investigators will ask if you would like to have the study and all of its procedures, risks, and benefits explained to you again. You will be encouraged to ask any questions that you may have.

We will ask that you not smoke, drink any alcohol or take any caffeine the day before and the day of your visit for the experiment. We will also ask that you not eat or drink (other than water) two hours before the experiment. Also, we ask that you come to the Dalton Center wearing comfortable clothing that will allow the phlebotomist to draw blood from your arm.

### **What information is being measured during the study?**

We will be taking measurements of two hormones found in blood: oxytocin and adrenocorticotrophic hormone. In addition, we will be measuring your sense of “flow” through a written survey instrument.

### **What are the risks of participating in this study and how will these risks be minimized?**

A risk of providing blood can include mild to moderate pain at the site of the needle puncture into the vein. Other risks could include temporary redness, minor bleeding, swelling and a bruise at the site of the needle puncture or, rarely, an infection. Ice will be available if minor swelling or bruising occurs. Should signs of an infection present, please seek consultation with a physician at Sindecuse Health Center, Bronson Hospital, or with your primary care physician. Some people feel dizzy or faint when blood is taken; however, most people do not experience any problems. These risks will be minimized by an experienced phlebotomist trained in proper blood draw and sterilization techniques. Snacks and water will also be available should you feel faint. Although possible, most people do not experience any problems given the limited amount of blood collected for this study’s purposes.

As in all research, there may be unforeseen risks to the participant. If an accidental injury occurs, appropriate emergency measures will be taken; however, no compensation or additional treatment will be made available to you except as otherwise stated in this consent form.

**What are the benefits of participating in this study?**

There are no direct benefits to you from participating in this study. If you are interested, the investigators will provide you a copy of the results after the data have been analyzed and the study has been completed. You may be interested in learning about research and some of the laboratory procedures used in collecting research data.

**Are there any costs associated with participating in this study?**

There are no costs associated with participating in this study.

**Is there any compensation for participating in this study?**

Each participant will receive a \$50 Amazon.com gift card.

**Who will have access to the information collected during this study?**

The principal investigator, student investigators, and committee members of this thesis project will have access to the information collected during the study. In order to maintain confidentiality, a random identification number will be assigned to you and used in place of your name. The original data will be retained in a locked cabinet in the locked office of the Principal Investigator in the School of Music at Western Michigan University for a minimum of three years after the completion of the study.

**What if you want to stop participating in this study?**

You can choose to stop participating in the study at anytime for any reason. You will not suffer any prejudice or penalty by your decision to stop your participation. You will experience NO consequences either academically or personally if you choose to withdraw from this study.

Should you have any questions prior to or during the study, you can contact one of the student investigators, Jason Keeler or Brittany Neuser, at 269-387-8841, or the primary investigator, Edward Roth at 269-387-5415. You may also contact the Chair, Human Subjects Institutional Review Board at 269-387-8293 or the Vice President for Research at 269-387-8298 if questions arise during the course of the study.

This consent document has been approved for use for one year by the Human Subjects Institutional Review Board (HSIRB) as indicated by the stamped date and signature of the board chair in the upper right corner. Do not participate in this study if the stamped date is older than one year.

---

I have read this informed consent. The risks and benefits have been explained to me. I agree to take part in this study.

---

Please Print Your Name

---

Participant's signature

---

Date

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