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The Effects of Movement Activities on Beginning Instrumental String Students' Perception of Musical Pulse and Rhythm

Claudia Lasch Deiboldt
The College at Brockport

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The Effects of Movement Activities on Beginning Instrumental String Students'
Perception of Musical Pulse and Rhythm

by

Claudia Lasch Deiboldt

January 2010

A thesis submitted to the
Department of Education and Human Development of the
State University of New York College at Brockport
in partial fulfillment of the requirements for the degree
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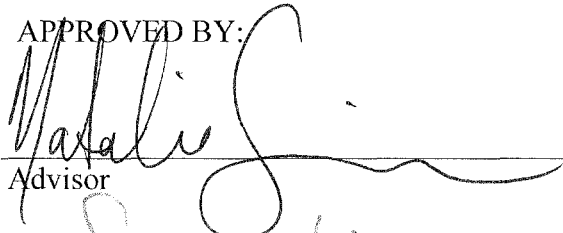
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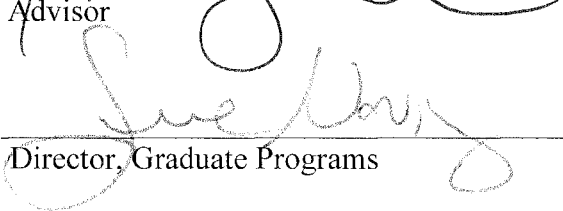
Claudia Lasch Deiboldt

APPROVED BY:



Advisor

1-29-10
Date



Director, Graduate Programs

1-26-10
Date

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Chapter 1

Introduction

Steady pulse is vital to all humans and is most basic to our existence. The constant beating or throbbing of the heart is considered to be one of nature's most basic rhythms. Our world is full of rhythm in nature, work and play and is so basic to our existence and environment that it is taken for granted most of the time. Music reflects human life; like life, the core to its existence lays in the vital elements of pulse and rhythm. Rhythm, a system of long and short note values, provides the senses with a measure of time, be it regular or irregular, that we experience in our world. Music devoid of pulse and rhythm is merely random pitch; unsatisfying to the ear's need for a sense of steady pulse and time. As basic as these elements are to human nature, producing steady beat and rhythm is often a challenging concept to teach to young students.

There is a familiar scenario that takes place in every instrumental music classroom as new students arrive excited about showing teacher what they have accomplished over the course of a week. Instruments are taken up, printed music is presented and students begin the complicated task of coordinating what they see on the page and how they can produce it on their instruments. The young musicians labor to address posture, move fingers to just the right spot, push enough air through the horn or get the bow moving in the right direction on the string. It is a huge challenge at that early stage that

exercises both brain hemispheres (Jensen, 2000). However, in that struggle to perfect posture, breathing, fingering and bowing the vital musical element of pulse and rhythm gets lost. In their efforts to combine all these tasks, students completely ignore the concept of steady pulse as they speed up in easy musical passages or slow down in difficult passages. Every music teacher witnesses this phenomenon and spends a great deal of time every day helping students overcome it.

Reading and understanding music, like language, is a complicated task with the added complexity of combining analysis of specific symbols with motor skills needed to complete the music making task. For string students in particular, the prospect of analyzing symbols for rhythm and pitch teamed with gross and fine motor skills simply proves to be too much information to process at once. Development of all these skills are not yet internalized enough for some students to combine successfully. As a result, they experience overload and must eliminate what aspects of the process they deem unnecessary. In her study on the effects of movement instruction on steady beat perception, Rohwer (1998) cites Miller's information processing theory on how the brain can process only a limited amount of new information at a time before it begins to filter out stimuli. In the case of the beginning instrumental student, we often see students filtering out steady pulse or rhythm in favor of pitch, and kinesthetic tasks related to their instruments particularly if they do not yet have a strong concept of steady pulse. There are

several music education methods that have recognized and addressed the issue of the learning child and steady beat.

Eurythmics, a rhythmic movement approach using the whole body, designed by Emile Jacques-Dalcroze has been used extensively with young children in the preschool and elementary music classroom (Dalcroze, 1930). Dalcroze's observation of his students led him to conclude that in regards to rhythm, a disconnect between mind and body hindered students' ability to effectively express themselves musically. His movement techniques were designed to create body awareness to expand and reinforce cognitive understanding, and to overcome physical inhibitions connected with musical performance.

More recent psychological studies have backed Dalcroze's theory that movement may help students better remember ideas and concepts more efficiently than simple aural cues. Howard Gardner included the kinesthetic sense as a means to providing hands on learning opportunities for children in any discipline (Moran, Kornhaber & Gardner, 2006).

Keeping in mind the success of rhythmic movement in the early classroom and cognitive research's findings on the importance of movement in learning, this study will examine the effects of rhythmic movement activities on student perception of steady pulse. The following questions will be addressed.

- How do beginning instrumental students perceive steady pulse and rhythm?
- How are students' perceptions of steady pulse and rhythm changed after participation in movement activities in weekly lessons?
- What strategies do students develop through movement to assist in their steady pulse and rhythm perception?

Investigation of these questions may have important bearing on instructional emphasis in the instrumental classroom. In the past, many instrumental music educators have assumed children to have reached a certain level of competency in regards to steady pulse and rhythm by the time they reach middle school level. Elementary teachers still provide instruction in rhythm using techniques of Orff, Kodaly and Dalcroze along with other more recent rhythmic movement approaches to reinforce understanding. However, changes in educational priorities that cut instructional time or cut instruction entirely, may have a serious impact on students' ability to gain full understanding of the importance of pulse and rhythm as a skill in music.

For many students a lack of steady beat perception means an inability to produce music that makes sense or is pleasing to the ear. When students come together to play without a sense of steady beat or synchronization, an inordinate amount of time is spent trying to piece the ragged results together. Progress is slowed for everyone involved and elements of music such as tone and expression are delayed for a much longer period of time. Instrumental

music teachers who have limited rhythmic movement to foot tapping and clapping in the past may find it beneficial to use a portion of instrumental instruction time for some rhythmic movement to reinforce and strengthen rhythmic instruction in the elementary music classroom. Added time spent in this area may make instruction of pulse and rhythm less time consuming over the long term as students gain stronger awareness and understanding through hearing, seeing and doing. Internalizing the concept of steady pulse will free young musicians to concentrate on other music skills such as pitch and expression in their music making.

Rhythmic movement in the instrumental music classroom is a logical strategy when working with young instrumentalists. The work there may fill a large gap in perception that has been left by cultural and educational changes.

Chapter 2

Literature Review

In determining the value of movement in learning, it is important to research several aspects. The longevity of movement activity in the elementary music classroom demands we look back to observe theories of some of music education's most revered teachers and how their theories on movement in learning inform how we teach many years later. Psychological research on human perception of pulse and rhythm aligns well with early theorists concerning the benefits of movement in learning and supports the use of hands on activities in aiding student understanding of musical concepts. Researchers in music education combine accepted theory and practice with current psychological research in their own studies in an attempt to formulate better informed theories that will boost the effectiveness of instruction in the music classroom. This literature review takes a historical look at the rhythmic movement theories of Kodaly, Orff and Dalcroze, psychological research as it applies to music education and music education studies that research specific teaching and learning strategies for use in the classroom. These three aspects of research round out the study on effects of movement activities of beginning string students' perception of pulse and rhythm.

Early Educational Theories on Rhythmic Movement

The element of rhythm is fundamental to music. Definitions of rhythm most often tie its qualities to movement. Plato described musical rhythm as having a connection with the movement of the body. Patricia Shehan cites musicologist Willi

Apel as referring to rhythm, as “the whole feeling of movement in music” and “movement in time and space,” (Shehan, 1987). There is a strong natural connection between movement of the body and rhythm in music. Since early times, a romantic view has paired musical rhythm with movement in nature such as the ebb and flow of waves in the ocean or the call of birds. In the same way, folk music of every culture has often evolved to reflect the rhythmic movement of the human body at labor. Similarly, music from our western civilization, often possesses a strong suggestion of the beating heart or waves of human emotion, (Findlay, 1971).

The natural relationship between music and rhythmic movement may be seen in reverse as our bodies respond to a catchy rhythm that causes us to snap our fingers or inspires us to move more vigorously in our daily exercise. Our emotional response to music may trigger involuntary inner movement such as increased heart rate and respiration. This natural connection between the aesthetic and kinesthetic is universal and experienced by adults and children alike, (Shehan, 1987; Findlay, 1971).

Emphasis on rhythm training through movement took shape early in the 20th century and evolved from movement and dance activities used to relieve academic stress and boost effectiveness of learning in students. The use of folk dancing, walking, skipping and jumping were found by music teachers to be very effective ways of teaching rhythm. Music educators/theorists Zoltan Kodaly, Carl Orff and Emile Jacques-Dalcroze, each embraced the practice of large muscle movement to teach rhythm and other musical concepts. Their theories and practices changed many

elementary music teachers' instructional approach from one of lectured presentation to hands-on experience, (Shehan, 1987; Woods, 1987; Stabley, 2001).

Kodaly's basic goal was to create a foundation to prepare children to read and write music. The first step was to develop the feeling of basic beat through experience with clapping and stepping to the beat. Movement, he felt, should be relatively unstructured but remain closely related to the lyrics and rhythm of the music. Children responded to a variety of tempi and musical styles by often combining varieties of movement. His whole body approach to movement developed awareness of body rhythm and the movement of others while utilizing his vast collection of traditional folk music and dance (Wheeler & Raebeck, 1973; Woods, 1987).

Orff combined the spontaneity of youthful movement with song. His Orff-Schulwerk approach to teaching combined a variety of experiences using speech, rhythm, movement, singing and playing. Songs, rhythmic rhymes and chants built awareness of sensations tied with such musical qualities as light and heavy or smooth and jagged. Orff is quoted by Saliba (1991) as stating, "Elemental music is never music alone but forms a unity with movement, dance and speech" (p. 16). For Orff, movement was the key to success in rhythmic learning in music.

Orff's use of free movement utilized four basic body movements to highlight musical concepts: stomping, clapping, snapping fingers and patsching, a light tapping of the thighs with the hands. These multiple experiences to movement and expression gave children the opportunity to create and participate in music before learning musical notation (Woods, 1987; Saliba, 1991).

Dalcroze's educational theory on movement, called *Eurhythmics*, translated 'good rhythm,' was the first approach to be developed by a musician specifically for the music classroom (Findlay, 1971; Campbell, 1991). He believed there to be various learned behaviors within each culture that often inhibited musical expression.

Through his own teaching experience he found that many young musicians possessed a cognitive understanding of musical concepts, but lacked a physical experience of them, creating a kind of mind-body duality that blocked expressiveness in their music making abilities (Dalcroze, 1930). Dalcroze well understood the power of music and maintained its ability to strengthen communication between muscles and mind.

Juntunen & Westerlund, (2001) cite Dalcroze's approach to rhythmic movement as a means of bringing the mind, body emotion and music together as a conscious human experience. Dalcroze summed up his theory by writing, "The object of education is to enable pupils to say at the end of their studies, not 'I know,' but 'I experience' and then create the desire of self-expression." (Dalcroze, 1930, p.58). He stressed that rhythm instruction in terms of movement, must precede instrumental instruction.

Only as rhythmic awareness and control is strengthened through motor and kinesthetic memory may more advanced music training begin (Dalcroze, 1930).

Proponents of Dalcroze's *Eurhythmics* agree. When listening to a piece of music we are often able to mediate what we hear through another mode of imagination; the movement of our body and the feelings that accompany it (Callan, 1985; Findlay, 1971; Dalby, 2005). Elsa Findlay states, "when children can identify

their own movement patterns with rhythmic patterns they hear, music becomes a language easily understood in terms of his own motor imagery,” (Findlay, 1971, p. 3).

Cognitive Research and Theory in Music Education

The theories of Kodaly, Orff and Dalcroze developed early in the twentieth century remain viable today as more recent research in the area of cognitive learning lends its support.

Curriculum specialist Eric Jensen has taken an extensive look at cognitive research from the past decade and found that the arts and extensive use of kinesthetics in learning has a strong, positive impact on brain activity. He cites the work of numerous researchers when he illustrates how complex movement activates more systems in the brain than traditional seatwork in education.

Research by Calvin (as cited in Jensen, 2001) found that environmental conditions or constraints we face when participating in movement requires the brain to perform an intricate interplay between at least 12 separate neurobiological systems. Jensen cites Corso (1997) when listing a stream of tasks we undertake when performing complex or novel movements that involve most of our brain. “We suddenly must make rapid decisions, keep our attention up, monitor our emotions, remember our past, be alert for potential problems, create solutions on the spot, keep our balance, watch the expression on other’s faces, move quickly and gracefully - and somehow remember the point of the activity” (Jensen, 2001, p.73). As a result, memory expert Arthur Reber (as cited in Jensen, 2001) says the implicit learning that

takes place through kinesthetics is longer lasting, attainable at any age, and appears to be independent of intelligence measures.

The 12 separate neurobiological systems at work in movement and learning lay a foundation for Howard Gardner's Multiple Intelligences theory which describes separate but interactive cognitive strengths individuals use as they attempt to grasp new information. Gardner (1999) defines the intelligences as "biopsychological potential to process information that can be activated in a cultural setting to solve problems or create products that are of value in a culture" (pp.33-34). According to Gardner, no two people possess the same combination of intelligences, which is the challenge of education. However, as teachers look for student strengths in learning and incorporate a variety of learning experiences to lessons, they will be able to reach more students in more effective ways. He further states, "in learning a concept, students exhibit understanding when they can invoke new ideas flexibly and appropriately to carry out specific analyses, interpretations, comparisons, or critiques- and especially, to perform their understandings with respect to new material" (p.169).

The theory that genuine understanding may be achieved best by combining conceptual learning with experiential is put into practice by Torff and Gardner in their ArtsPROPEL approach to learning in music (1999). They cite researcher Bennett Reimer who outlines two main forms of musical cognition: conceptualization and experiential. While conceptualization concerns the learning and mental organizing of disciplinary terms and terminology, experiential cognition refers to the emotional and aesthetic response to music illustrated by the process by which musicians in an

ensemble listen and respond to each other in a performance. Experiential cognition involves a “tacit” learning acquired through interaction between teacher and student as teachers model their own skills. The method provides concrete experience toward this goal by putting three interrelated cognitive skills to work; production/performance, perception/aural discrimination and reflection/critical perception and production. All intelligences are integrated into a series of extended learning activities including musical, logical, bodily-kinesthetic, spatial, linguistic, interpersonal and intrapersonal. Reflection-in-action activities in which students listen, watch and respond, expand experiential knowledge of concepts without use of discussion of technique as the intuitive sense comes into play and tacit understanding of concepts is learned (Torff & Gardner, 1999).

The pedagogical approach in ArtsPROPEL allows students to learn using a variety of intelligences such as social, spatial, kinesthetic, musical or reflective that builds on experience in a constructivist fashion rather than an abstract, disconnected way (Moran, Kornhaber & Gardner, 2006). The continual stream of perceptual opportunities for students to see, hear and feel a conceptual idea leads to stronger understanding.

A parallel may be drawn between Torff and Gardner’s ArtsPROPEL and Dalcroze’s unifying of mind and body (Dalcroze, 1930). Both approaches expand understanding through multi-skill instruction. Students are provided with different means of responding to what they see and hear while allowing teachers to observe and obtain insight of students’ perspective of learned concepts.

Other research with a look to a multifaceted approach to learning backs this theory. Shehan (1987) found that a multifaceted approach to rhythm learning through use of mnemonics, aural modes and visual modes was beneficial for young students as well as those who were more experienced. The aural and/or visual stimuli were immediately grasped by students and simultaneous exposure of both stimuli appeared to sustain retention of rhythms among young students with little previous instruction in music.

Although not focusing her study on the use of rhythmic movement as a stimulus, she acknowledged its importance by prefacing her work with a citation of an instructional summary designed by Radocy & Boyle (1979) who stated development of rhythmic behavior is “inextricably related to movement.” The summary incorporates the use of a variety of kinesthetic rhythmic responses to learned rhythm patterns which includes counting rhythms out loud, tapping or clapping rhythm phrases, conducting beat patterns, use of eurhythmics, use of rhythm syllables or words and rote performance (Shehan, 1987).

In the same vein Persellin (1992), designed a study with a multisensory approach to rhythm incorporating aural, visual and kinesthetic modes. The purpose was to examine the effect of the three modalities on the recall of rhythm patterns in first, third and fifth graders. Results suggest that visual presentations of rhythmic patterns for young learners could successfully be coupled with auditory and kinesthetic presentations, increasing rhythmic learning efficiency. Combining the modes does not appear to confuse students. Visual stimuli were less useful in

rhythmic learning for younger, less experienced students. In this case Persellin suggested increased use of aural and kinesthetic instruction.

Also supporting a multifaceted approach to learning, Nadon-Gabrion (2001) cites Engle as saying the mind works in both verbal and nonverbal ways that should not be separated. They are most useful when functioning in a cohesive, integrated fashion. She suggests ideas in which movement and language can be used together to appeal to various learning modes. The commonalities of language, music and movement are time, space and sound and all three require skills of aural, kinesthetic and visual perception. Language can serve as a bridge to understanding basic concepts in music and movement. Students may visually discriminate a movement or sequence of moves, then imitate or describe what they see. A motor response of what they see provides an important means to feel and translate a new concept (Nadon-Gabrion, 2001).

One area of cognitive research benefiting education includes music perception. Response to musical pulse and rhythm is unique to humans. This musical rhythmic behavior, or MRB, is rhythmic response characterized by two interconnected features. The first is the ability to establish regular pulse from an external stimulus such as a drumbeat. The second is the ability to maintain a regular musical pulse over a sustained period of time and is referred to as period correction (Bispham, 2006).

In his exploration of MRB, Bispham cites London, (2004) as setting musical rhythm apart from a non musical or working rhythm in that it is maintained over time and is perceived clearly and strongly or at related hierarchal levels.

Rhythm difficulties are commonplace in the music classroom and educators look for solutions to assist students with rhythmic perception and response. There has been an explosion of cognitive research carried out within the past fifteen years which has opened up new understanding in how we learn and respond to our environment; a good amount has focused on the brain's response to music which music education researchers have used as a basis for their own work.

Earlier proponents of the Kodaly, Orff and Dalcroze theories did not have such research at their disposal, but they were able to witness the long term effects their rhythm and movement curriculum had on students and their ability to express themselves musically. Perception is the key as young children explore the world through their senses. They will naturally use movement to accompany or mimic what they see, hear and feel, (Moog, 1976). The movements that develop can be naturally repetitive and as motor awareness comes together with visual and aural senses, rhythm experience is strengthened, (Stabley, 2001). This natural process of learning through what children feel, see and hear may be nurtured and directed by eurhythmists who design motor experiences that provide a strong, vivid, rhythmic sense, appealing to children's sense of fun.

Research in Music Education

When considering new activities in the classroom it is important to become familiar with aspects of the activity that may influence success for the students involved. Gilbert (1979) took an assessment of motor skill development in young children. The purpose of the study was to examine and describe motor skills and how they are influenced by various external factors in children ages three through six. The results provide a perspective on motor skill and how it must be considered when assessing students' abilities to respond to musical stimuli. Gilbert's hypothesis based on previous research, (Groves, 1969) was that variations in motor skills related to music performance would improve with chronological age. The research was carried out with 808 children aged three through six from seven towns in eastern Kansas. Gilbert developed and administered The Motoric Music Skills Test (MMST) which measured the variables of Motor Pattern Coordination, Eye-Hand Coordination, Speed of Movement, Range of Movement and Compound Factors. Data from all variables showed similar results, suggesting motor skills improve with increased age but that there may be some minor differences between genders.

Rohwer's (1998) study of the effects of movement instruction on steady beat perception, synchronization and performance was founded on the practices of Orff and Dalcroze. The study focused on seventy sixth grade students who were divided into a treatment group which received kinesthetic instruction based on Dalcroze theory and a control group that received traditional rhythm instruction consistent with previous instrumental music activities. The independent variable was the planned movement activity, while the dependent variables were perception, synchronization

and performance. At the end of ten weeks of instruction both groups were measured on all three dependent variables. Data was analyzed on deviation between the subject's response and the correct response. Rohwer found no measurable improvement in beat perception in either the treatment or control group, concluding that perception as a variable is too vague to measure accurately. Within the synchronization variable, Rohwer found marked improvement in the treatment group suggesting the ability to move rhythmically can be improved with some training. The performance variable again showed marked improvement of the treatment group over the control group, with the treatment group showing a stronger ability to correct synchronization and performance. Rohwer's findings of the positive effects of rhythmic training differ from that of Groves (1960) and Gilbert (1979) who found advancing age to be the only influence on improved rhythmic response in young children. The fact she was working with older children who have overcome coordination issues of early childhood may be important to consider.

Classic theory (Campbell, 1991; Dalcroze, 1930; Jungtunen & Westerlund, 2001; Moran, Kornhaber & Gardner, 2006) and practice (Findlay, 1971; Nadon-Gabrion, 2001; Riveire, 1995; Woods, 1987) along with increased understanding of movement on brain stimulation and learning (Jensen 2001) has led to important research on the effects of rhythmic movement and response in music training (Gilbert, 1979; Groves, 1969; Rohwer, 1998). Kinesthetic activity as hands on learning strategy appears to have proven itself over the years as a means of combining muscle and brain memory, building experience for long term learning and opens a

greater opportunity for understanding among those students who learn well in the physical sense. Connecting rhythmic movement from the elementary music classroom with related activities in the instrumental music classroom may help students internalize the function of rhythm in the music they perform as well as highlight the importance of pulse and rhythm when participating in ensemble music.

Chapter 3

Methods

Traditional instrumental music instruction makes use of clapping and foot tapping to check student understanding but does not address whole body responses that are very important in the performance arts. This study plans to utilize basic teaching techniques suggested by Dalcroze to investigate whether or not whole body response activities help instrumental students better understand the concept of pulse and provides strategies for them to solve rhythmic problems on their own when performing their music.

This study will take place in a middle school of a small, suburban college community in Monroe County of western New York. The school district is considered to be the poorest in Monroe County based on the average salary of its residents.

The methods described in this chapter are based on the following research questions.

- How do beginning instrumental string students perceive the rhythm reading process?
- How are beginning students' responses of rhythmic reading changed after participation in movement activities?
- What strategies do students use to demonstrate their understanding of rhythm after participation in movement activities?

Participant Selection and Research Environment

The six students participating in the study are currently sixth graders in the middle school, average age, 11 years. The gender breakdown is three males, three females. Ethnic breakdown is five white students, one Afro-American. One student is bused in from a neighboring urban community. Two students have participated in the string program for two years, one has participated for one year; three have joined within the past three months. Each week, participants meet for one, hour-long, small group lesson and three 50 minute large group orchestra rehearsals.

Participant selection will be based on four main factors: availability, age, amount of time in the string program and difficulty demonstrating steady pulse/rhythm. The researcher meets with middle school students on a more regular basis compared to younger elementary students, making both consistency of instruction and data collection more feasible. The age of middle school students eliminates some, but not all, issues with coordination compared to younger elementary aged students. The time students have been involved in the program will allow the researcher to observe any differences in pulse/rhythm perceptions based on the amount of instrumental experience. All participants have demonstrated some evidence of difficulty in maintaining a steady pulse when clapping/playing alone or with others.

The study will take place in the middle school orchestra room located on the ground floor of the building. It is large, spacious and normally contains

three rows of folding chairs, music stands, a piano and stereo system. Chairs and stands will be removed for safety during the time movement activities take place.

Materials

Rhythmic movement and instruction will be based on Dalcroze's Eurhythmics as presented by Findlay (1971). Findlay, a student of Dalcroze, was a proponent of the Dalcroze theory which states accurate musical rhythm is expressed best when motor consciousness is developed in students. Activities will connect with objectives behind this theory which include using the larger muscle groups to create strong awareness of the connection of rhythm and movement, giving individual students specialized movements relating to motor skills needed to perform on their instruments, developing a strong listening ability that allows students to make a connection between what they hear and how they move and blending mind and body. (Findlay, E. 1971) (Appendix A).

Materials to be used in the weekly lesson activities will include:

1. Small percussion instruments

- hand drum/tambourine to provide variable pulse for student response

2. Musical recordings for examples of pulse and rhythm

- two new contrasting examples of fast/slow; heavy/light presented each week and used as a basis for movement activities

3. Student instruments

- violins, violas, cellos, basses and harp played and used to demonstrate understanding of pulse and rhythm being learned

4. Metronome

- used to provide steady, variable pulse in activities

Surveys (Appendix B) will be distributed to elementary classroom music teachers in the school district to find out how movement may have been used in participants' previous music training. Interviews will be given to participants during lessons prior to the start of the study to find out what they remember about previous movement instruction in elementary school, what concepts they remember learning through movement and whether they believe movement activities were a good way to learn about music (Appendix C).

A pretest and post test will be administered with the use of the same rhythm exercises extracted from the *Essential Elements 2000, Volume Two*, method series used in current music lessons by participants. The rhythmic examples will be rewritten to eliminate pitch and retain rhythm (Appendix D). Students will be asked to perform these either by clapping or playing on

instruments along with pulse established by a metronome. They will be checked for accuracy of rhythm and ability to follow pulse of the metronome.

Procedure

The study will be carried out in the 2007-2008 school year and will begin after midterm, continuing for approximately six weeks. Rhythmic movement instruction will occupy approximately 30 minutes of each weekly lesson along with supplemental instruction for ten minutes of each orchestra rehearsal. Data will be collected on each participant at every weekly lesson and during supplemental activities during orchestra rehearsals. Data collection will begin by distributing teacher surveys and student interviews which will be compared to check for commonalities and anomalies. The pretest on rhythmic performance will be administered prior to rhythmic movement instruction and analyzed using a performance rubric and videotape. Transcription of videotapes will be organized during the weeks of instruction to observe student response to musical stimuli, changes in response, evidence of heightened proficiency and developing strategies by students for establishing and maintaining pulse. Anecdotal records from mini conferences will also be implemented to gain insight on student perception of activities and development as instruction progresses. Post test performances administered after completion of rhythmic movement instruction and will contain the same rhythmic examples as the pretest and be graded by the same performance rubric. Results of the pretest and post test will be compared to

determine whether there is measurable improvement in student ability to maintain a steady pulse and rhythm and whether students use learned strategies or develop their own strategies to maintain steady pulse over the course of the study.

All data will be compared and categorized, looking for common themes or issues that reoccur. It will be important to continually watch for new or unexpected responses that could change the direction of the study or require additional data. Feedback from colleagues may bring new perspective on data as it is being gathered.

Jacques-Dalcroze's educational theory on movement in music has been in place in the music classroom for nearly a century. Educators still use his techniques, write about them and offer extensive workshops because the movement is well suited to musical elements and they believe in the value of his work and the results over time.

Chapter 4:
Data Analysis

Data collected was used to answer the following research questions.

Question 1: How do beginning instrumental students perceive steady pulse and rhythm?

With this question I was looking for student responses to a variety of rhythmic stimuli whether it was a simple, steady pulse from a drum, music using a strong marching beat or lively dance music. I observed and made note of students' kinesthetic responses to what they heard. I was interested in movement size, direction and variety which included the parts of the body students used in their responses. Above all, it was important to see whether or not their physical responses were synchronized and to observe the conditions that lead to asynchrony. When the pulse used in an activity changed speed, it was observed how quickly and accurately students were able to adapt their responses.

Data were gathered from videotape transcriptions of student responses from a variety of rhythmic movement activities as well as student interviews and pretest/posttest playing performance results.

In the first week of the study, students performed a preliminary activity using a metronome which could be set and activated to a wide range of pulses from 40 – 208 beats per minute (bpm). The metronome was equipped with a red flashing light that was synchronized with the pulse and provided a visual cue for students to

follow. The object was for students to respond to what they heard and saw by clapping along with the metronome's pulse as closely as they could. They were provided with an eight beat introduction to see and hear before beginning their clapped response.

Students' individual responses were very similar. Within a range of 96 - 132 (bpm) the focus students were able to match the metronome's audio and visual cues very closely by clapping along for at least 20 seconds. Beyond 20 seconds, two students seemed to fall behind the beat slightly. When the pulse was set in the range of 60 - 88 bpm, a slower pulse, students had more difficulty synchronizing their clapped responses. All five students began to clap faster than the given pulse only a few seconds after beginning their response meaning the time between claps became shorter the longer they attempted to clap with the pulse.

This gradual increase in clapping speed despite attempts to synchronize is explained by research focused on the sensory codes underlying the task. The difficulty in maintaining a slower pulse may support the idea Fraisse defined in his work as preferred tempo; an individual's natural speed of kinesthetic response (Krumhansel, 2000). Individuals are best able to synchronize their body movements to a pulse that falls within the range of their body's own comfortable, inner tempo. When a pulse is set below their comfortable, natural range, subjects may struggle to maintain synchrony as my students did in their clapped responses. Another point to consider is the Paillard-Fraisse hypothesis which suggests that processing times differ in the brain between the kinesthetic code represented by clapping and the

auditory code represented by the click of the metronome. Sensory information takes longer to move from the finger to the brain than from the ear to the brain. For synchronization to take place the move to clap must precede the click of the metronome (Ascherleben & Prinz, 1995). Bispham (2006) cites research by Repp (2004) on synchronization and temporal perception. Repp defines a sensorimotor function termed *period correction* as a continuous modification of responses on the basis of inconsistencies between a timekeeper interval and the previous stimulus interval, thus altering the period of the performed rhythmic response. Period correction is a skill unique to humans, allowing us the ability to set the tempo of a rhythmic activity. This was illustrated in the activity that took place in the second week of the study as students were asked to walk in a circle, synchronizing their steps to a beat from a tambourine that ranged from 80 bpm to 144 bpm. For this activity, students responded using lower body muscle groups. The only visual cue available was to watch peers' kinesthetic responses. The speed of the pulse began at a middle range of 104 bpm and gradually increased to 144. Students altered responses in movements as the tempo increased in speed. One student (Va-4) began to turn his normal walking steps into strong marching steps, picking his feet up higher off the floor as well as swinging his arms more forcefully as though power walking. He began to watch the other participants closely and was able to remain synchronized with the pulse. As the tempo of the pulse gradually slowed to 80 bpm, the student's walking motion and posture changed. He gradually began to drag his feet over the floor as though he were imitating the feeling that each beat from the

tambourine was drawn out, extended and elastic. His upper body leaned forward as though he wanted very much to move faster. As the space between each beat became longer, it became much more difficult for the student to predict when the next foot step should take place and he had difficulty keeping his movements synchronized (Krumhansel, 2000).

Another student, (VnI-3) who had been stepping with something of a shuffle and with hands in his pockets at 104 bpm removed hands from his pockets and used a more precise stepping motion as the pulse gradually increased in speed to 144 bpm. Although he kept looking straight ahead without watching movements of others, he was able to quickly bring his movements together with the pulse. As the pulse gradually slowed to 80 bpm he also had some initial difficulty in synchronizing but he managed to stabilize quickly, returning to a less marked gait. For both students attention, intention and awareness necessary for period correction became strongly evident in their personal demeanor and change in kinesthetic responses which, it would appear, assisted in making more rapid adjustments (Bispham, 2006).

Problems with slower speed synchronization and temporal responses reoccurred throughout the study. In the third week of the study a pulse on a tambourine was provided at approximately 66 bpm. The beats were counted off verbally in groupings of four, “one, two, three, four,” repetitively which is commonly referred to as duple time. Students counted off into four separate teams. Each team chose a single movement that would be performed on one specific beat

of the four beat grouping. Team 1 would perform their movement on beat one, team two on beat two, etc.

Student VnII-2 was on team 1 which chose a movement requiring her to take one step forward and open her arms forward on beat 1 of each beat grouping. In the first counting sequence the student was well synchronized with the group but hesitated too long to respond in the second sequence. The speed of the pulse was slow even though it appeared that it should have allowed plenty of preparation time for the next response, it was difficult for the student to respond on the appropriate count.

Fraisse's cognitive research focusing on rhythm perception cited by Krumhansel (2000) found that when listeners heard a sequence of sound events that were spaced more than 1.5 seconds apart, they most often perceived the sound events as disconnected and had difficulty organizing them into groups. The responses by VnII-2 may align with Fraisse's observation. If she was focused on isolating her performance beats from the rest of the grouping and waiting only to respond to her beat, the timing may have been too long and disconnected for her to respond correctly, particularly when the given pulse was set at 66 bpm. As the speed of the pulse gradually increased to 84 bpm, the student's kinesthetic responses became better synchronized both with the beat and with her team perhaps because the gap between performances of her movement came closer together and seemed less disconnected.

Student Va-4 experienced some of the same difficulty with his team's movement of stomping one foot on pulse 2. The large gap in time between responses at 66 bpm seemed to make it difficult for him to keep track of the count and he would often stomp two counts later on count 4. As was the case with VnII-2, it appeared easier for him to coordinate his movements with the count and his team as the tempo increased in speed (Krumhansel, 2000).

In the case of Va-4 it may be that motor skill combined with differences in kinesthetic and auditory processing hindered accuracy in certain tasks (Ascherleben & Prinz, 1995). At the same time, it appeared accuracy benefited when the student's attention was aroused. Bispham (2006) cites a study by Repp & Keller that found period correction, the ability to adjust and synchronize one's temporal kinesthetic responses to stimuli, is strongly dependent on the variables of intention, attention and awareness. Motor issues aside, it was observed that Va-4's performance did improve as he became further immersed in the activity and his attention was drawn to the responses of other students. Through observations of the visual cues around him he became more aware of his role in the chain of events. His intention, then, became stronger to match, or at least fit his responses with the responses of his peers (Bispham, 2006).

The presence or lack of attention, intention and awareness were evident in the activity that followed in the fourth week of the study. In this event, music by John Philip Sousa was played for students. The pulse has a strong marching beat (duple) which means the beats are arranged in groupings of two beats with the first beat

being strong and the second being weaker. After listening to the music for several counts, students were asked to walk across the room in time to the beat of the music. The majority of students started their movement evenly. Student Hp appeared to listen carefully to the music and responded by tapping her hand on her thigh to the pulse before beginning her walk across the room. Her attention to the pulse and showing her awareness through a preliminary movement response aided her intention to succeed at the task she was asked to carry out (Bispham, 2006).

VnII-2's first steps were not well synchronized with the pulse presented in the music, however, her response improved in the second half of the march as she began to watch other students' steps and worked to match them. This is another illustration of how intention, attention and awareness improved performance for her.

Similarly, Va-4's initial response got off to a shaky start. He gave no indication of any preliminary response that would show awareness of his first perception of the musical pulse. His attention was drawn to another student who was fidgety and unfocused. As the activity continued and he was able to bring his attention back to the music and movement of those around him, his ability to synchronize improved greatly.

Student Va-3 on the other hand, gave no preliminary response to what he heard, did not watch other students in the line and gave no indication that he was aware of the need to match his steps to the given pulse. His response was an example of the lack of intention, attention and awareness variables needed for period correction and successful synchronization kinesthetic response to a stimulus.

The first week of activity focused on use of the metronome and its accompanying flashing light provided a strong stimulus and visual cue for students to follow. Students responded to what they saw and heard and did their best to match their movements accordingly. The following week's activity of walking to the beat of a tambourine required students to respond to the pulse they heard and saw by watching their peers' responses in the circle. Listening and watching seemed to heighten awareness which improved synchronization, especially at times when the pulse sped up or slowed down. The third week's activity of teams responding with a chosen movement to an assigned beat to a tambourine also supported Repp & Keller's theory on intention, attention and awareness. Students who listened to the beat and watched one another for visual cues fared better than those who had a tendency to look straight ahead. Those students who began with uneven responses or who performed their movement out of sequence improved when they began watching not only their fellow team members who were performing in sync with them but also the members of other teams who surrounded them and performed at different times of the grouping sequence. By observing the movements of all their peers, student perception of pulse, movement synchrony with fellow group members and intended asynchrony with other team members improved (Bispham, 2006).

Question #2: What strategies do students develop through movement to assist in their perception of steady pulse and rhythm perception?

Videotapes of weekly rhythmic activities and pretest/ post test performances were studied carefully for any kind of student response showing student attempts to

make sense of stimuli offered before they began their required activity. Student interviews that took place at the conclusion of some lessons provided insight into student thought processes and perceptions of kinesthetic activities. In addition, responses from teacher and student surveys past rhythmic movement experience were compared to see if strategies learned in earlier grades were being used by students for current rhythmic tasks.

The teachers responding to the survey both teach at the fifth grade level. Teacher 1 has extensive experience working full time in the choral classroom area while Teacher 2 works primarily as a beginning band instrument instructor with six hours of classroom music duty a week. Both teachers use movement almost daily in their various lessons.

The survey began by asking the teachers whether they subscribed to a particular theoretical approach when incorporating movement into their instruction. Both claim an eclectic mix of Dalcroze Eurhythmics, which utilizes the full body as well as Orff's body percussion and dance approach and Kodaly's focus on dance (Findlay, 1971; Callen, 1985; Campbell, 1991; Woods, 1987). Teacher 1 uses movement as a learning tool not only in regular classroom instruction but also in preparation of music for performance with her large group chorus. Teacher 2 uses more full body techniques in her classroom music lessons but keeps activity limited to body percussion (clapping and foot tapping) in her instrumental music classes. Both teachers' use of movement in the different instructional areas aligns with traditional approaches within the music education field. While choral instruction and

classroom music embraces the full body awareness theories of Dalcroze, Orff and Kodaly which encourage structured and improvised movement, instrumental instructors traditionally lean toward the use of body percussion (clapping, foot tapping) while students remain seated and omitting the element of improvisational activity (Rohwer, 1998).

When surveyed about previous experience with movement in the music classroom, every student who responded remembered using such activities and being accustomed to doing them. Student Hp who had participated in the choral program listed a wide variety of movements used in her experience such as “clapping, stomping, snapping, walking, jogging, hopping, swaying, tapping” as well as “rhyming and making up her own movements” to go with the rhyme. Gerard and Auxiette (1988) found the use of verbal cues such as rhymes, help children mentally organize rhythmic sequences by creating temporal boundaries for each sequence. These mnemonic phrases may be used to go a step further with movement activity to provide concrete experience in rhythm reproduction.

Hp’s list of activities was the most comprehensive. However, numerous students recalled some of the same activities in their responses to the survey. A majority of students mentioned clapping, hopping and tapping in their responses. There were other activities listed by students. VnI-3 remembered being asked to clap rhythms he had composed, while VnII-2 remembered performing jumping jacks and arm stretches. Va-3 had done an activity that required shadow movement while Va-4 moved to the beat and clapped in previous classes. The wide variety of movement

they described reflects techniques of Dalcroze, Orff and Kodaly and was experienced in their choral classroom lessons (Findlay, 1971; Wheeler & Raebeck, 1973). Each student response brought a slightly different view to the activities performed in their elementary classes. The common thread among the majority of responses was that students remembered enjoying their movement experiences while several students remembered the musical element supported by the activity.

Teachers were asked about use of extra materials or “props” in movement activities. With limited class time and space both Teacher1 and Teacher 2 keep their instruction free of many extra materials but occasionally use koosh balls or scarves to enhance movement lessons. Rohwer’s study on teaching steady beat and synchronization combined movement with the use of various items including jump ropes and bean bags. These items served to enhance and draw attention to the act of steady pulse, rhythm and synchronization through use of a variety of visual and tactile experiences, keeping in mind that students may respond more favorably to one experience than another (Rohwer 1998; Gardner 1999).

Students did not mention the use of props in movement in their survey responses perhaps because their use was an exception rather than a rule in the classroom and they were focused on the movement itself in answering survey questions.

Teachers were asked to list other musical elements or concepts they teach through movement. Teacher 1 works with students on the concept of dynamics, a form of expression focused on volume. She uses large scale movement for loud music

and smaller sized movement for soft music. In relation to the element of musical expression, activities center on the mood of the music relies on students' improvised movement when asked to react to slow, brooding music or fast, lively music. In an article discussing the purpose of music appreciation through movement, Callan (1991) states, "it helps for us to mediate what we hear through another mode of imagination, one more familiar: the movement of our own bodies and the feeling associated with those movements" (p. 43). This mediation calls for students to interpret what they hear and associate it with a feeling in their bodies. This leaves a strong impression of what the music is about and can strengthen the mind/body connection (Dalcroze, 1930; Juntunen & Westerlund, 2006; Moran, Kornhaber & Gardner, 2006)

The element of structural form refers to sections of a piece of music that contain contrasting musical themes, rhythms or moods. When highlighting this musical aspect, both Teachers 1 and 2 asked students to improvise a variety of movements reflecting the main features of each section of the music. The improvised movements were performed when each contrasting section of the composition was heard. In this way students had a kinesthetic and visual understanding of the form of the music they were hearing (Gardner, 1999; Findlay, 1971).

Texture, the layering of various melodies, rhythms or contrasting sounds is another musical element in which both teachers utilized movement as a teaching tool. Teacher 1 described an activity using four different movements for four different musical phrases performed in a round. Using the contrasting movements allowed

students to hear and “see” the four separate phrases that comprised the total texture of the music.

When asked what they remember learning through movement from previous years, students surveyed overwhelmingly included rhythm or rhythm related ideas in their answers. Their almost uniform responses may have been due to the fact they knew we were embarking on a series of lessons based on rhythm and movement, bringing that element foremost to their minds. Primarily students referred to learning how to keep a steady beat, the meaning of the term *tempo* and focusing on the value or duration of musical notes. They may well have been able to describe other concepts and the ideas but perhaps could not come up with accurate terminology for the ideas they remembered and so chose not to list them in the survey.

Teachers were asked whether the use of movement was a more effective means of teaching musical concepts compared to various other lessons used to teach the same concepts. Both 1 and 2 responded it was not necessarily the most effective; they had other techniques and strategies they used in their instruction that worked equally well. Teacher 2 referred to Howard Gardner’s theory on Multiple Intelligences as her reason for use of movement. She found it important to “access learning styles of all her students” and found Gardner’s approach of keeping cognitive strengths in mind important when preparing lessons (Gardner, 1999; Saliba, 1991; Torff & Gardner 2006). She added movement in learning appealed to the vast majority of her young students. Teacher 1, reflecting on a long career in music education, felt she taught just as well in a space with no room to move for a number of years. However, she added

that teaching concepts through movement was more fun for her as a teacher and for the students because “it is an inherent part of who children are. They love it,”

Her response is in agreement with Saliba (1991) who states, “Children love to express themselves through movement. The creative teacher can find a multitude of ways to include this vital element such as movement to accompany singing, gestures with the body, creative movement with or without sound and of course, dance. We are reminded that as we teach children the concepts of music we must focus on the different ways children learn and provide continuous, multiple experiences to broaden children’s understanding which includes rhythm, melody harmony and movement (Saliba, 1991).

Responses from students seemed to support that notion. Hp said she loved the movement activities because “it got us moving and helped us understand too.” Her enthusiasm for movement in learning indicates not only that the fun factor makes the experience more memorable, but that in her opinion, using movement seems to solidify her understanding of rhythm or musical form more than if her teacher merely talks about the concepts or writes details on the board

Hp’s kinesthetic intelligence seems to be well developed making it an enjoyable way to learn and an effective means of demonstrating what she knows and understands as illustrated in the ArtsPROPEL program proposed by Torff and Gardner, (Gardner, 1999; Torff & Gardner, 2006).

VnI-3 also said it was fun to create his own rhythms and perform them by clapping. His response suggests that movement such as the clapping, tapping or

patsching promoted in the Orff Schulwerk approach helped him build on knowledge already learned so that he was able to create or improvise his own rhythms as was suggested by Teacher 1 in her survey response.

However there were students in the study who were a bit more reserved or doubtful on the subject of movement in learning. VnII-2 answered that the movement activities she remembered from elementary days were “O.K.” Va-4 “sort of liked them and... didn’t mind doing them.” Neither student was opposed to participating in movement lessons but the activities didn’t seem to be as memorable or provide the same source of enjoyment they had for Hp. In their case, movement combined with other hands-on activities in rhythm may be more effective in creating those concrete experiences such as use of simple percussion instruments, visual representations of rhythm, making up mnemonic phrases or rhymes to fit rhythmic sequences.

Va-3, on the other hand, was quite honest about his view on past movement activity. He didn’t particularly enjoy doing them and he “felt ridiculous” when he did. The cause for this is not stated by the student but may point to the student insecurity in being able to coordinate the movements as others do or perceived gender roles that boys are not supposed to participate in dance-like activities. Regardless of his concern, the use of movement should not be entirely omitted from his learning experience. While whole body movement activities such as those used by Dalcroze or Findlay may be too uncomfortable for him to be useful, it is still important to consider the number of important methodologies that point to effective learning through rhythmic movement. Orff’s clapping, tapping or body percussion may still be helpful

in having him experience rhythm and can be combined with activities more analogous with the playing of his instrument such as bowing exercises. These will assist in building his coordination and rhythmic competence while being better suited to Va-3's comfort level (Riviere, 1995). Nadon-Gabrion (2001) points out that to foster a willingness to learn, experience in music or other arts should be productive and non-threatening in nature. Differing perceptual experiences that hold varying degrees of expectations may provide more useful learning experiences other than movement alone. Additional lessons may include drawing visual representations or composing rhymes reflecting rhythms being audiated (Gardner, 1999; Dalby, 2003; Gerard & Auxiette, 1988).

When asked about the power of movement activity changing student perception of a concept the teachers' responses were interesting. Teacher 1 felt kinesthetic activity to be more effective when building on acquired information. Physical participation seemed to have a lasting impression that helped students remember concepts and ideas. In her opinion, concept building from lesson to lesson became easier. She added that "music is a participation sport." Teacher 2's response tied in with that thought when adding her students stayed engaged and participative for longer stretches of time when doing movement activities. Overall, students agreed with their former teachers that movement was helpful in remembering musical ideas. VnI-3 said movement allowed him to "interact" with the music and "helped him remember it more," while Hp recalled her teacher's explanation for using the physical activity as helping the musical ideas "go through our heads better if we did movements

every day before class.” Va-4 seemed to feel the movement helped him understand while Va-3 had no response to the question. This thought is supported by general educators and music educators alike. Woods (1987) quotes well known educator Rudolph Laban who states, “Movement leads to growth and structure” (p.36). Woods further adds, “The motor process serves an organizing function for perceiving, conceptualizing, and understanding music,” (p.36).

The response to the movement surveys taken by music teachers and former students indicate that an extensive amount of movement was incorporated into music instruction in students’ previous experience. Teachers have chosen to emphasize movement in their lessons because the theory of leading music educators and theorists that movement is a natural inclination for learning in children rings true for them in their own classrooms, (Findlay, 1971; Shehan, 1987; Stabley, 2001). More importantly both have found although not all students claim to love a kinesthetic approach to learning, the majority of students respond favorably, not only remaining focused on the day’s lesson for a longer period of time but also remembering concepts over weeks and months.

Student response seems to agree that movement in music class is a memorable part of their past musical experience. Many are able to describe very specific kinesthetic activities such as shadow movement even though they may not be able to recall by name the concept behind the movement experience. Even those who do not seem to favor a kinesthetic approach to learning are able to describe past lesson activities focusing on specific musical concepts or ideas.

Pretest and Post Test Comparisons

The remaining data analysis attempts to identify whether students drew upon experience in music movement to accomplish rhythmic tasks. As a performance pretest administered before the start of rhythmic instruction, students were presented with four lines of basic rhythm sequences (Appendix D) and asked to play them on their stringed instruments. The first rhythmic sequence was easiest, with each succeeding sequence increasing in difficulty. A pulse of 120 bpm was provided before the start of each sequence performance. Three aspects of the performances were noted. First, as students prepared to perform each sequence it was observed whether or not they displayed any outward signs of movement as a preparation strategy for thinking through the rhythms they saw on the page. Once their performance began it was noted how accurately they performed each rhythm and finally, whether or not their rhythmic performances remained synchronized with the given pulse. The results of their performances were compared to a four step rubric designed for pretest administration (Appendix E). The rhythm post test took place six weeks later at the conclusion of the rhythmic movement instruction period. This performance evaluation was identical to the pretest with the same four lines of rhythm sequences of varying difficulty for students to perform on their instruments. The 120 bpm pulse was provided before the start of each sequence and students were again observed for outward signs of movement as a preparation strategy, accuracy of rhythm and synchronization with the given pulse. The results of each student's pretest and post test were compared.

Student Hp Pretest and Post Test

Student Hp seemed to display a consistent preparation strategy for thinking rhythms through before performing them. For sequence 1 of the pretest as well as the following three sequences, Hp appeared to lightly tap a string of her instrument to coincide with the rhythms in preparation to perform. Rhythmic accuracy was accomplished in sequences 1 and 4 with some inaccuracies in sequences 2 and 3. Synchronization to the given pulse was accurate in all four sequences. Overall, Hp demonstrated consistent rhythmic synchronization with all four sequences.

Hp consistently used movement preparation strategies before performing sequences in the pretest, activities in class and post test. She demonstrated a strong sense of pulse from the beginning of the study which was illustrated through successful synchronization of all sequences in both tests. Use of preparation strategies seemed to help her in particular when successfully performing the more difficult rhythms in sequences 1 and 2 of the post test.

Student: Hp	Pretest	Post Test
Rhythmic Sequence 1	Preparation strategy: finger lightly taps rhythm on string of instrument	Preparation strategy: moves arm to beat
	Rhythm: accurate	Rhythm: accurate
	Synchronization: accurate	Synchronization: well synchronized with pulse of metronome
Rhythmic Sequence 2	Preparation strategy: finger taps rhythm on string	Preparation strategy: silently plucks strings with finger
	Rhythm: measure 1: inaccurate measure 2: inaccurate measure 3: accurate measure 4: inaccurate	Rhythm: correct

	Synchronization: accurate	Synchronization: rhythm well synchronized with given pulse
Rhythmic Sequence 3	Preparation strategy: finger taps rhythm on string	Preparation strategy: moves arm to beat
	Rhythm: measure 1: accurate measure 2: inaccurate measure 3: accurate measure 4: inaccurate	Rhythm: accurate
	Synchronization: accurate	Synchronized: well synchronized throughout exercise
Rhythmic Sequence 4	Preparation strategy: finger taps rhythm on string	Preparation strategy: moves arm to beat
	Rhythm: accurate	Rhythm: accurate
	Synchronization: accurate	Synchronization: moved very well with the beat

Student VnI-3 Pretest and Post Test

Student VnI-3 showed evidence of a preparation strategy in three out of four rhythmic sequences, demonstrating the same strategy as Hp in lightly tapping the rhythm of each sequence on a string of his instrument. Even with no visible preparation in sequence 1, he performed each rhythm accurately and well synchronized with the pulse.

In both the pretest and post test, VnI-3 chose not to use a visible preparation strategy for sequence 1. He may have perceived the rhythm as being easy enough to perform without the use of preparation. The strategy of lightly tapping the string with a finger in the pretest changed to phantom bowing the rhythm in the post test. Phantom bowing, an arm movement that mimics the act of drawing the bow back and forth over strings, uses a larger group of muscles which may have been influenced by movement activities in class that required use of larger muscle groups. While

phantom bowing allowed me to see VnI-3's perception of the rhythm, it also illustrated the premise behind Dalcroze's principle of Eurhythmics; that of combining what he saw on the printed page with what he felt in the bowing motion.

(Dalcroze,1972; Findlay, 1971).

Student: Vn1-3	Pretest	Post Test
Rhythmic Sequence 1	Preparation strategy: no preparation	Preparation strategy: no preparation
	Rhythm: accurate	Rhythm: accurate
	Synchronization: accurate	Synchronization: accurate throughout
Rhythmic Sequence 2	Preparation strategy: lightly taps rhythm on string with finger	Preparation strategy: phantom bowing rhythm
	Rhythm: accurate	Rhythm: accurate
	Synchronization: accurate	Synchronization: very well synchronized with pulse
Rhythmic Sequence 3	Preparation strategy: lightly taps rhythm on string with finger	Preparation strategy: phantom bow rhythm, bob to beat
	Rhythm: accurate	Rhythm: accurate
	Synchronization: accurate	Synchronization: rhythm well synchronized with pulse throughout
Rhythmic Sequence 4	Preparation strategy: lightly taps rhythm on string with finger	Preparation strategy: phantom bow rhythm
	Rhythm: accurate	Rhythm: accurate
	Synchronization: accurate	Synchronization: very well synchronized with given pulse

Student VnII-2 Pretest and Post Test

Student VnII-2's preparation strategies varied from no visible movement to phantom bowing the rhythm, to nodding her head slightly to the pulse. She provided no visual cues to indicate she had settled on a specific strategy for preparation.

Rather, she was experimenting with various strategies hoping one would help her carry out her rhythmic task successfully.

VnII-2's rhythmic interpretations were, for the most part accurate. The biggest hurdle for her in each sequence was remaining synchronized. For her, the Paillard-Fraisse hypothesis of sensory information being delayed from finger to brain may hold true. VnII-2 ability to process what she hears from the metronome and anticipate the movements to maintain a steady flow of the rhythmic sequences is delayed (Ascherleben & Prinz, 1995).

VnII-2's post test performance improved over her pretest in that she was much more aware of the importance of keeping her rhythms synchronized with the pulse. Although she did make use of some movement in preparation of most sequences, they were inconsistent and faint. Finding a more consistent preparation strategy for her may be helpful for more challenging rhythmic phrases. A step by step process utilizing a rhythmic focus without the use of instruments followed by an instrument transfer that of performing the rhythmic sequence on the instrument may need to be implemented for her (Riviere 1997; Stabley, 2001). She performed the most difficult sequence 4 successfully without a visible preparation strategy.

Student: VnII-2	Pretest	Post Test
Rhythmic Sequence 1	Preparation strategy: no movement	Preparation strategy: head nodding to beat, slightly
	Rhythm: accurate	Rhythm: accurate
	Synchronization: slightly ahead of pulse	Synchronization: behind pulse, slower
	Preparation strategy: no movement	Preparation strategy: bobbing head to a beat

Rhythmic Sequence 2	Rhythm: mostly accurate but unsteady	Rhythm: accurate
	Synchronization: hesitations causing to fall slightly behind pulse	Synchronization: remains steady with pulse throughout
Rhythmic Sequence 3	Preparation strategy: phantom bowing, slight	Preparation strategy: head bobbing to a beat
	Rhythm: accurate but hesitant	Rhythm: measure 1 accurate measure 2: accurate measure 3: inaccurate measure 4: inaccurate
	Synchronization: behind pulse from measure 2 to end of line	Synchronization: early in exercise student pulls ahead of the pulse and pauses briefly midway to let pulse catch up to the rhythm
Rhythmic Sequence 4	Preparation strategy: head nodding to beat, slightly	Preparation strategy: none
	Rhythm: accurate	Rhythm: accurate
	Synchronization: behind pulse, slower	Synchronization: stayed with pulse throughout exercise and appeared cognizant of importance of remaining synchronized

Student Va-3 Pretest and Post Test

Student Va-3 showed no visible use of movement strategy in thinking through the rhythmic tasks. He experienced significant difficulty with accuracy in rhythmic performance and synchronization. In all four examples the tendency was to speed up or cut rhythmic durations shorter which would cause him to pull ahead of the pulse. With no visible preparation strategy it was difficult to determine how he perceived the rhythms on the page. Fraisse's theory of an individual's natural speed of kinesthetic response may apply to Va-3. Although an attempt was made to establish a pulse of 120 bpm which would have been comfortable for most students, Va-3's

personal internal speed of kinesthetic response may be faster, making it difficult for him not to pull ahead (Krumhansel, 2000).

Comparison between Va-3's pretest and post test suggests that his ability to play and synchronize rhythms had improved somewhat. The post test showed improvement in performing sequences 1 and 2. However, when performing the more difficult sequences 3 and 4 he had significant difficulty with both rhythm and synchronization. Va-3 has expressed a dislike for the use of movement and avoids its use when given a choice. His dislike for movement activity may block his attention, intention and awareness of the importance of synchronizing movement to pulse and hindering his musical rhythmic behavior as outlined by Bispham (2006). In observing his participation in practice and class activities, it seems likely his dislike may be due to some difficulties in motor skill. Use of some movement activity on a regular basis may help improve motor skill along with rhythmic synchronization awareness. Combining some movement with observation and self-reflection as proposed in the ArtsPROPEL approach may assist in making a mind/body connection for effectively feeling rhythms in music (Torff & Gardner, 1999; Dalcroze, 1972; Findlay, 1971).

Student: Va-3	Pretest	Post Test
Rhythmic Sequence 1	Preparation strategy: no movement	Preparation strategy: none other than to look at written sequences and place bow on string
	Rhythm: accurate	Rhythm: accurate
	Synchronization: measure 3 falls behind beat to end	Synchronization: rhythm is well synchronized with pulse
	Preparation strategy: no movement	Preparation strategy: none

Rhythmic Sequence 2	Rhythm: accurate	Rhythm: accurate
	Synchronization: measure 2 pulls ahead of pulse to end	Synchronization: rhythm well synchronized
Rhythmic Sequence 3	Preparation strategy: no movement	Preparation strategy: none
	Rhythm: measure 1: accurate measure 2: inaccurate measure 3: inaccurate measure 4: accurate	Rhythm: measure 1: inaccurate measure 2: inaccurate measure 3: inaccurate measure 4: inaccurate
	Synchronization: measure 2 pulls ahead of pulse	Synchronization: difficulties remaining on beat; half of exercise not synchronized with given pulse
Rhythmic Sequence 4	Preparation strategy: no movement	Preparation strategy: none
	Rhythm: measure 1: inaccurate measure 2: inaccurate measure 3: accurate measure 4: accurate	Rhythm: measure 1: inaccurate measure 2: inaccurate measure 3: inaccurate measure 4: inaccurate
	Synchronization: pulls ahead of pulse slightly but improved over previous examples	Synchronization: not synchronized with pulse

Student Va-4 Pretest and Post Test

Student Va-4, like VnII-2 showed a combination of different preparation strategies. Example 1 showed no visible preparation while Example 2 found him nodding his head to an imagined beat. In Examples 3 and 4, Va-4 tapped his fingers on the shoulder of his instrument while studying the rhythmic tasks.

Va-4's pretest showed he did not favor any specific movement strategy for working out rhythmic tasks. Sequences 1 and 4 showed the most accurate performances however in sequence 1 he displayed no visible strategy while in sequence 4 he tapped his fingers on his instrument. In sequences where Va-4 used a

movement strategy, it displayed pulse, not rhythm. Despite that fact, his ability to remain synchronized with the pulse in any of the rhythmic tasks was inconsistent.

Va-4's pretest and post test performances show minimal improvement in rhythmic and synchronization skill. As in the case of VA-3, his lukewarm stance on the use of movement may be keeping him from utilizing a regular strategy and hinder his attention, intention and awareness for the importance of synchronization, affecting his rhythmic responses (Bispham, 2006). What small movement he did utilize, that of tapping a finger on the instrument or nodding his head, was eliminated in the post test where no strategies were used in any of the sequences. Although he performed sequences 1 and 2 successfully in the post test, he had significant difficulty performing sequence 3 which held inaccuracies in each measure and sequence 4 which he was unable to complete.

Student: Va-4	Pretest	Post Test
Rhythmic Sequence 1	Preparation strategy: no movement	Preparation strategy: none
	Rhythm: measure 1: accurate measure 2: accurate measure 3: accurate measure 4 inaccurate	Rhythm: correct
	Synchronization: accurate	Synchronization: slightly behind pulse most of the way; not well synchronized
Rhythmic Sequence 2	Preparation strategy: nodding head to imagined beat	Preparation strategy: none
	Rhythm: measure 1: accurate measure 2: inaccurate measure 3: inaccurate measure 4: inaccurate	Rhythm: accurate
	Synchronization: unsteady but overall keeps rhythm within given pulse	Synchronization: rhythm moves well with pulse

Rhythmic Sequence 3	Preparation strategy: taps fingers on shoulder of instrument	Preparation strategy: none
	Rhythm: measure 1: accurate measure 2: accurate measure 3: inaccurate measure 4: inaccurate	Rhythm: measure 1: inaccurate measure 2: inaccurate measure 3: inaccurate measure 4: inaccurate
	Synchronization: most of example not synchronized; behind given beat	Synchronization: not well synchronized
Rhythmic Sequence 4	Preparation strategy: taps fingers on shoulder of instrument	Preparation strategy: none
	Rhythm: accurate	Rhythm: incomplete
	Synchronization: accurate until the final measure; falls behind the beat	Synchronization: rhythm not well synchronized with pulse

After a six week series of movement activities focused on use of kinesthetic responses to rhythmic stimuli, data was collected to see whether or not students utilized movements when asked to perform four rhythmic sequences on their instruments. Data from the study's post test showed that of the five participating students, three had made use of some variation of movement to prepare. The various movements chosen were finger tapping, foot tapping, head nodding and phantom bowing. Those students who chose such strategies in their preparation improved in their post test performances over their pretest performances. The two remaining students who did not utilize a movement strategy before performing post test sequences did not improve measurably and in fact, gave a poorer performance in the post test compared to the pretest.

Students who provided favorable responses in their surveys and interviews concerning past movement activities and tasks in class were more likely to prepare

their performances with the use of movement than those students who gave lukewarm or negative responses in the surveys and interviews.

Chapter 5:

Summary and Conclusion

The results of my observations of students using movement for beat and rhythm instruction highlight the importance of some of music education's leading theorists such as Orff who believed music does not stand alone but is unified with other elements, including movement (Saliba, 1991). Dalcroze spoke of blending mind and body together through movement in order that students not only say they understand a concept but experience it (Dalcroze, 1930). Findlay supported the mind/body theory of her mentor, Dalcroze by stating music becomes a language easier to understand and interpret when children identify rhythmic patterns with the movement of their own bodies (Findlay, 1971).

The students in this study who embraced the opportunity to learn through movement and use it when preparing rhythmic tasks fared significantly better on the post test than those students who preferred not to use movement. The experience of combining what they see, hear and feel creates a special learning experience that cannot be duplicated by remaining passive (Jensen, 2001). This was illustrated best by VnII-2's improvement in synchronizing the post test rhythm sequences over her pretest rhythm sequences. Despite the fact that her post test rhythms were not always perfectly performed, she did show a heightened awareness in keeping the rhythms she performed coordinated with the pulse. Students Hp and VnI-3 showed improvements between the pretest and post test performances, with improved rhythm and synchronization.

The overarching concept behind the use of kinesthetic activity in learning is that students combine what they *hear*, *see* and *feel* to internalize knowledge and understanding of new concepts. This idea aligns with Repp & Keller's theory that period correction, the ability to adjust and synchronize one's temporal kinesthetic responses to stimuli, works best when the variables of intention, attention and awareness are present (Bispham, 2006). Considering the aspect of visual stimuli in learning, a study by Persellin (1992) suggests visual presentations of rhythmic patterns for young learners may successfully be coupled with auditory and kinesthetic presentations, increasing rhythmic learning efficiency. These visuals may include standard musical notation, artistic interpretations of rhythmic patterns, or body movement modeled to represent rhythms.

Videotaped data of weekly activities where students were asked to walk in a circle to a pulse from 80 bpm to 144 bpm showed those students who watched their peers' movements while performing their own fared significantly better in their synchronized responses than those who did not. Focusing on feet alone eliminated students' ability to take in other helpful stimuli that would heighten the variables of attention and awareness. When students began watching others' movements and moved to match what they saw, their responses became more precise. When the pulse changed, their body's attempt to synchronize was quicker and more accurate. The act of combining aural, visual and movement stimuli in these activities raised students' attention and awareness which supports Repp & Keller's theory on period correction in rhythmic perception (Persellin, 1992; Bispham, 2006).

Two of the five students in the study had significant difficulty with synchrony in the pretest and post test. The cause for this may be attributed to a multitude of factors including a perceptual gap between their auditory code and their kinesthetic code. The hypothesis posed by Paillard & Fraise suggests that sensory information takes longer to be processed between the fingers and the brain than from the ear to the brain (Bispham, 2006). Students hear the pulse from the metronome but their physical response is slower, causing them to fall behind. In their attempt to make up the gap, they anticipate the beat and inadvertently jump ahead, causing fluctuations in synchrony (Ascherleben & Prinz, 1995). It is possible the Paillard-Fraise hypothesis may explain one cause for students' difficulties but other factors may figure in as well. Continued observation of these students' responses to rhythmic stimuli may uncover difficulties in processing written material or sensory overload.

My primary purpose for this study was to investigate whether a variety of whole body activities and improvisational movement such as those traditionally used in the general music classroom could be used in the instrumental classroom to assist in internalizing basic musical concepts of steady pulse and rhythm. In addition to seeing improvement in many students' musical responses such tasks provided a window for me to observe and identify other underlying issues that caused difficulty in synchronization and rhythmic performance for some children. This may be the most important discovery of the study; one that will open the way toward more effective individualized instruction for students who will benefit from additional help in rhythmic performance.

In some cases it was discovered that students understood rhythm but had difficulty with motor skills making the bow awkward to manipulate rhythmically. For Va-3 it was discovered that spatial perception often affected his synchrony of rhythmic responses. In this case, having a physical therapist observe student performance and provide suggestions on specific exercises for fine tuning their ability to judge bow movement length and distribution might be an important step toward improved instruction. As a result, movements may be devised to practice smaller bow strokes for shorter note durations and larger movements for longer note durations with study of specific rhythm patterns

VnII-2's sense of synchronization improved significantly during the study. Her biggest hurdle seemed to be in the process of reading musical notations and producing them in tempo on her instrument. For her, a strategy of steps for reading and internalizing rhythms will include performing them with large muscle group movements, smaller muscle group movements, mnemonic phrases, verbal counting of rhythms, phantom rhythm bowing and finally, rhythmic performance on her instrument.

Va-4 had difficulty coordinating the rhythmic movements of the bow with left hand fingering patterns on the strings. Rhythmic movements will be practiced separately in the left and right hands then gradually combined for improved coordination and synchrony.

As was the case with Va-3, not all students are comfortable with movement activity. Some have yet to fully develop certain fine motor skills while others have a

general lack of body awareness that makes them feel self-conscious. For these students blending kinesthetic intelligence with others such as social, spatial, kinesthetic, musical or reflective, as in Torff and Gardner's ArtsPROPEL approach to arts education, builds on experience in a constructivist fashion that provides other opportunities for tacit learning (Torff & Gardner, 1999; Moran, Kornhaber & Gardner, 2006). Students such as Va-3 may not be fully receptive to weekly lessons in movement but they may be willing to participate in a series of pared-down movements or create artistic representations of rhythms being learned. Another approach may be to provide videos of instrumental performances and ask viewers to suggest a series of exercises that might work to improve what they see and hear in the video. Multiple activities that draw attention or place emphasis on rhythm in every day musical learning will be helpful to such students without making them feel exposed.

As the five weeks of movement instruction progressed it was observed that the majority of students participating showed signs of improved awareness, attention and intention to the task of performing rhythmic sequences. After the completion of the study, as movement activity dropped off, student attention to rhythmic accuracy also dropped. This suggests that for continued progress at this early stage of instrumental instruction regular weekly movement activity should be emphasized for an extended period to further develop student awareness and encourage movement as a strategy to solve rhythmic problems on their own.

Rhythmic movement is enjoyable for teacher and students. In her survey response, Teacher 1 used movement regularly in her classroom and choral instruction because, "it is an inherent part of who children are. They love it." Findlay (1971) points to a natural connection between the aesthetic and kinesthetic which appears to be universal and experienced by both adults and children. The educational theories of Orff and Kodaly focus on the spontaneity of youthful movement along with singing and folk culture (Saliba, 1991; Woods, 1987; Campbell, 1991). Data analysis revealed students' overwhelming pleasure of getting out of their seats to move. Their elementary school memories of learning music through movement were stated clearly and in some detail in which they described a wide variety of activities and movements used to teach various musical elements other than rhythm such as expression and texture.

In watching videotapes made of activities done in class, there are sounds of laughter, smiling faces and an enthusiasm that cannot be duplicated sitting at a desk. During the six weeks of the study, students often entered the classroom asking what "fun" activity we would do that day. They would end the weekly activities feeling exhilarated and instrumental performance connected with the activity would be accomplished quickly and with improved efficiency by the majority of students in the class.

Movement activity has been used for generations when teaching important concepts in many areas of education. It has earned a special place in music education as teachers have used improvisational or structured movement activities to broaden

student understanding in all elements of music and appeal to children's natural inclination to learn through hands-on discovery and exploration. Movement has also proven to be a useful means of creating a series of motor exercises toward performance of more complex musical tasks. Also, observation of individual students' movement may help identify difficulties with motor development or conceptual understanding. This may, in turn, allow teachers to utilize additional instruction or aid to students who may benefit from more attention in the affected areas leading back to Dalcroze's theory of uniting of mind and body.

Students are not aware all a teacher sees through simple movement to music. Their natural inclination to explore new ideas through movement in music is often a sharp contrast to the rest of their school day. They leave us happy, invigorated and with vivid memories of interacting with others around them. Students know they are having fun as they learn more about themselves and the world around them.

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Appendix A

Movement Activity Examples

1. Students stand in circle. At sound of beat from drum, students demonstrate walking in time to the beat and making appropriate changes in their step as pulse speeds up or slows down.

2. Students move to pulse of recorded music by tossing bean bag/ball back and forth to a partner.

3. Students move to pulse of recorded music by using jump rope to emulate tug of war movement with a partner.

4. Students emulate a four beat measure of music by standing in a straight line. Each student in line is assigned a number, 1, 2, 3, or 4. With pulse of drum or recorded music, students hop on the beat relating to their assigned number; students labeled 1 jump on beat 1, students labeled 2, jump on beat 2, etc. Students respond accordingly as pulse speeds up or slow down.

5. Student improvises a movement demonstrating a given pulse. Other students respond to movement by clapping to that pulse. As movement speeds or slows, so should clapping.

6. Teacher provides 4 beat rhythm on drum, students imitate by clapping or walking. When response is accurate, teacher varies speed.

7. Teacher sets beat on metronome. Students watch and listen, then respond with bowing movement synchronized to pulse. Teacher varies pulse speed.

8. Students improvise a movement to a 4 beat rhythm, demonstrate them to a steady pulse. Fellow students watch and imitate movement. After everyone has demonstrated their rhythms, each student performs their rhythms simultaneously to the same pulse.

Appendix B

Survey of Classroom Music Educators, Elementary Level Grades K-5

1. Do you currently use rhythmic movement activities in your classroom? How often?

2. Do you follow any traditional rhythmic movement instruction theories such as Eurhythmics or Orff-Schulwerk? What materials do you use in class?

3. What musical concepts are taught through movement in your classroom?

4. What is the general response of students to these activities? Do they enjoy them?

5. Is there a measurable change in student perception of concepts being learned after participation in movement activities? Is the understanding lasting?

6. Do you have a means of measuring student progress when using these activities?
Are
instruments such as rubrics or checklists used to measure student understanding through rhythmic movement activity?

Appendix C

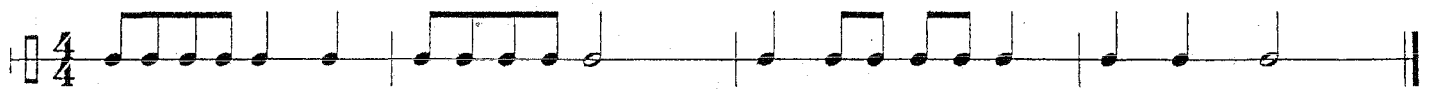
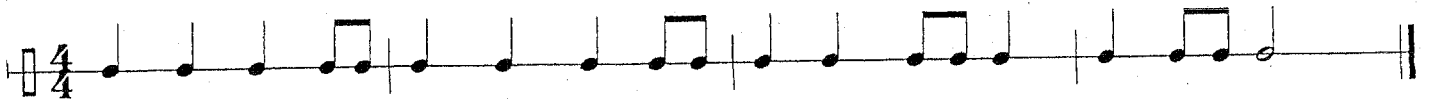
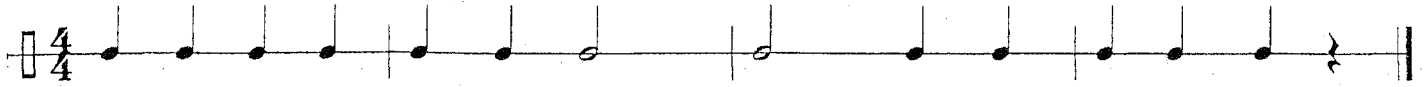
Student Survey Questions

The questions listed below have been designed by me to gauge the nature and amount of previous experience my instrumental music students have had in rhythmic movement. The survey will be available to all sixth grade instrumental music students. Consent and assent forms will be sent for permission to use student responses as data in the study.

1. Have you ever done movement activities in music class before?
2. Can you remember any activities you did in class? Can you describe them?
3. Did you enjoy the activities? How did you feel about doing them?
4. Do you remember what you were learning about music when you were doing the movement activity? Did the movement help you understand what was important about the lesson?

Appendix D

Rhythmic Notation Samples for Pretest and Post Test



Samples adapted from *Essential Elements 2000 for Strings*
by M. Allen, R. Gillespie and P. Tellejohn Hayes