THE EFFECT OF MOVEMENT INSTRUCTION ON MEMORIZATION AND RETENTION OF NEW-SONG MATERIAL AMONG FIRST-GRADE STUDENTS

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by

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MUSIC

THE EFFECT OF MOVEMENT INSTRUCTION ON MEMORIZATION AND RETENTION OF NEW-SONG MATERIAL AMONG FIRST-GRADE STUDENTS (224 PP.)

Director of Dissertation: Linda B. Walker

The purpose of this study was two-fold: (1) to investigate the effect of movement instruction on memorization and retention of new-song material in first-grade students, and (2) to explore the differences between the types of movement (nonlocomotor and locomotor) used in the process of instruction upon memorization and retention of new-song material. Participants for this study consisted of 92 first-grade students selected from a suburban public school in Northeast Ohio. These students were tested in two experiments. Through a group treatment procedure, using the whole-song approach, and individual testing of song learning across two time periods, a quantitative analysis measured the effects of movement versus non-movement instruction for the variables of text, pitch, rhythm, and melodic contour. Using the same whole-song approach, the same children, and the same testing procedures, a second experiment was conducted to determine the effects of locomotor and nonlocomotor movement instruction on text, pitch, rhythm, and melodic contour. The results of the two
experiments indicated that movement instruction significantly enhanced memorization of text, rhythm, and pitch. Further research on the specific effects of movement instruction on music learning and music literacy, as well as learning and literacy in general, is necessary. Successful music education practices depend on continued research on early childhood musical development.
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CHAPTER I
INTRODUCTION

Music is a language of sound and rhythm that is present in cultures around the world. When people hear music, they are often naturally and spontaneously inclined to move in response. Moog (1976) observed that infants instinctively synchronize their movements with music, while Condon & Sander (1974) affirmed that neonate movements are synchronized with adult speech. In some African societies there are not even two separate words to express the experience of music and dance. Instead, one word is used to describe the experience of music and dance as inseparable concepts. As individuals are raised in a society with music and movement, the existing parts of the brain that process music knowledge develop so that each individual is able to maximize his or her natural ability to code music (Spychiger, 2001).

Singing, just like movement, is a natural part of children’s growth and development. It is part of their everyday activity. Seefeldt and Barbour (1994) believed that children sing before they talk. For them, infants’ babbling and cooing seem to contain more elements of songs
than of words. Moog (1976) distinguished between babbling that is considered music and babbling that is a precursor of speech.

Infants as young as two months can match a pitch, and at the age of three to six months are able to consistently and accurately match pitches (Papousek, 1981). Furthermore, they are able to notice changes in melodies and melodic contour (Trehub, Thrope & Morrongiello, 1987; Trehub, Thrope & Trainor, 1990).

The significance of song learning in music education has led to an immense amount of research on song acquisition. The majority of this research has intended to determine the most effective method for teaching songs. Chen-Hafteck (1999) argued, for example, that the integration of text and melody exists at different levels and various degrees in children’s song-learning processes. She summarized numerous findings and concluded that text and melody are integrated in one’s cognitive process and thus, teachers should teach words and tunes at the same time.

Klinger, Campbell & Goolsby (1998) pointed out that methods for teaching songs vary and depend on teachers’ perspectives and lessons’ objectives. The most common method of teaching songs in the modern classroom is
repeated phrase method or/so called phrase by phrase. As researchers described it, the teacher presents a song to children sequentially, in small fragments, and asks children to repeat each fragment afterwards. Research in cognition (as cited in the Klinger, Campbell & Goolsby study) proposed that musical acquisition occurs in “chunks” rather than as a complete whole. Interestingly enough, Klinger (et al.) found that teaching children to sing through immersion (the whole-song method) is more effective, and that children make fewer errors, in terms of text, pitch, rhythm, and melodic contour, than children taught with the phrase-by-phrase method.

Their research is supported in a recent study by Chen-Hafteck (2002), who examined the song-learning process among four-year-old South African and American children, in order to find out how children from different cultures approach text and melody when learning songs. She concluded that both groups learn songs in a similar sequence. They acquire melodic contour, rhythm, and words simultaneously. Specifically, the accuracy of rhythm is achieved first, followed by words, and then melodic contour, for African children. By contrast, American children attain words before rhythm. During the experiment, Chen-Hafteck used the whole-song method as a rote learning approach, which is the
traditional African way of transmitting songs to children. She also found that young African children were more advanced in song development and used their singing voices more than did their American peers.

During a singing activity, it is natural for young children to accompany songs with some kind of body movement, such as clapping, patting, or bending. Movement, indeed, is a natural part of children’s lives and a primary response to music, which occurs even before birth. For children, music and movement seem to be synonymous (Zimmerman, 1984). Additionally, Lefrancois (1995) emphasized the close relationship between motor and cognitive development. Four- and five-year-old children respond well to active learning and they actually learn by doing. Anderson and Lawrence (2001) theorized, “Children need to respond to music by moving, singing, playing instruments, and creating” (p.9).

Music and movement seem to be linked due to the temporal nature of both music and movement. It has been found that children use the physical body as a learning aid when learning new song content; this concept is outlined in the psychological backgrounds and philosophies of Emile Jaques-Dalcroze, Zoltan Kodály, and Carl Orff (Choksy, Abramson, Gillespie, Woods, & York, 2001).
According to Merriam-Webster’s Dictionary (2008), movement is defined as a “change of place or position or posture.” Therefore, all movements can be described through the concept of space, where space could be personal (everything that can be touched without moving from one’s own position) and general (activities that involve moving from personal space). In other words, movements can be defined as locomotor (movements that transport the body from one location to another) or nonlocomotor (movements that are performed in one stable place, where the objective is movement with the different body parts). The basic locomotor movements are running, walking, leaping, jumping, hopping, galloping, sliding, and skipping. Examples of nonlocomotor movements are stretching, bending, turning, twisting, clapping, tapping, snapping, winking, and any movement in which one is not traveling (Postman, 2001).

The current use of movement in the music classroom is very diverse. A variety of movement activities ranging from large-motor movements, originated in eurhythmics, to the almost unnoticeable fingertip movements adopted by music educators, can be found in a typical music classroom. Atterbury & Richardson (1995) classified movements into three main categories: a) fundamental movements, such as walking, jumping, skipping, etc., b) structured movements
(movements incorporated into patterns, such as dances), and
c) creative movements, invented by children and adults as
an expression of personal understanding in response to
hearing music.

A review of research literature in music education,
with an emphasis on movement-based instruction, provides
insight into the relationship between movement and
children’s understanding of various musical elements. A
number of studies have been conducted with elementary-aged
students in order to examine the relationship of movement
and the development of musical concepts, and musical
learning in general. Particularly, several studies examined
the perception of melodic elements through movement in
combination with other musical elements (Cheek, 1979;
Crumpler, 1982; Lewis, 1986; Reeves, 1997).

For example, Crumpler (1982) specifically focused on
the perception of melodic concepts through movement-based
instruction. She found more accurate pitch discrimination
and proper identification of melodic direction with
students who received Dalcroze eurhythmics instruction,
while students who were instructed in a traditional manner
showed less accurate perceptions.

Dalcroze (1976) believed that rhythm is the source of
musicality, and considered the human body as a vehicle for
translating inner emotions into music. He suggested that all music concepts could, and should, be taught through physical movement; that is, the entire human body must be trained in order for an individual to understand music. As Campbell (1989) explained, for Dalcroze “The body was the mediator between musical sound and its mental construct” (p. 302). Dalcroze considered rhythmic training an essential part of music education, as well as general education, believing that rhythmic education could lead to self-understanding, self-discipline, sensitivity, and creativity. His principles align with contemporary education concepts in that they incorporate cognitive, affective, and psychomotor behaviors.

The Kodály method (Houlahan & Tacka, 2008) employs movement as a way to support the teaching process, which simultaneously provides children with a vehicle for expressing reactions to music. The combination of singing and movement together in the learning process can help reinforce the concept of beat and sometimes, vocal intonation.

The Kodály method is based on the importance of active learning - it is used to provide children with additional learning support through the use of visuals and physical prompts. Kodály method that includes active participation
and the use of multiple modalities in music education is designed to enhance the song-learning process and therefore, the retention of the song components. In this method, children model the melodic direction using creative movements, or they tap to the beat while singing the songs (Choksy, Abramson, Gillespie, Woods, & York, 2001). They also use movement when learning rhythm patterns. Two types of movements are used in Kodály’s classroom: nonlocomotor movements (movements in place) and locomotor movements (movements in space). As a final stage in the Kodály method, children use movements in dance, proceeding from circle to standard dances. Another technique used in the Kodály method involves the use of hand signs in order to represent different scale degrees. The hand signs, used as a mnemonic device, help students to visualize different pitches and determine melodic direction.

Carl Orff (Choksy, et al., 2001), influenced in his early years by the work of Dalcroze, developed his own approach to teaching music. Orff regarded music in total unity with speech, dance, and movement, and he considered the body the most important instrument. He believed that the natural rhythmic movements found in children’s play are the basis for all music. The main components of his approach are exploration and experience (Choksy, et al.).
Using movement to explore space is stressed as a critical piece of the Orff approach to teaching music.

With the successful introduction of the Dalcroze approach in general music classrooms at the turn of the 20th century, movement and its impact on the learning process received a great deal of scholarly attention. The idea that movement is beneficial in music education has received extensive approval among scholars and music educators. Wise (1993) concluded that the rationale for incorporating movement into music education has been largely based on the developmental needs of young children. Movement is a natural response for children: “Movement, in general, is the use of the body and its parts to communicate feelings, ideas, images, and interpretations” (Kuroda, & Burton, 1981, pp. vi-vii).

The influence of music instruction on academic achievement and cognitive abilities has been widely recognized, and has received great attention among scholars and educators in recent years. The majority of research findings conclude that, generally, music activities and instruction positively affect students’ academic progress.

In particular, studies by Nicholson (1996) and Register (2001) showed that the study of music improved reading and writing abilities in children. Edge (2005), who
has been practicing singing and signing (finger spelling), claimed that this activity accelerates language acquisition for young children. She argued that combining “saying and doing” increases retention of new information and understanding of language concepts by up to 90%. Studies by Reeves (1997) and Raisner (2002) confirmed that movement education and rhythmic music opportunities facilitate greater gains in language acquisition in preschoolers. Specifically, Gromko (2005) found that after 4 months of music instruction kindergarten children scored significantly better in their abilities to discriminate individual sounds or phonemes of a spoken word (phoneme segmentation tasks). Gordon (1997) also supported the notion that musical development engages processes similar to those in language acquisition.

Musical melodies and structures are not entirely specific to music; research has revealed links between certain music features (e.g., tempo and melody) and the production of language. In songs, the fusion of music and language enables perception of these entities as a unified whole; Serafine, Crowder & Repp (1984) referred to this phenomenon as an integration effect. Since Aiello (1994) emphasized similarities between the perception of music and language in terms of phonetic, syntactic, and semantic
levels, it might be logical to conclude that “singing and doing” would increase memorization and retention of new (musical) information.

Purpose of the Study

The purpose of this study was to investigate the effect of movement instruction on memorization and retention of new-song material, specifically with first-grade students. This study was initially designed to fill a gap in the current and available research on the topic of music memorization and movement instruction.

More specifically, this research was meant to determine whether or not children in first grade responded positively to music instruction with movement, and further, what kind of movement (if any) had the most impact on music learning outcomes (recall accuracy based on number of errors). Using carefully chosen, simple songs, and natural and simple movements, I examined and observed the reactions of first-grade students to movement instruction.

This study focused on the accuracy of song-learning and song-recall in terms of pitch, text, rhythm and melodic contour. Two time periods were used to assess the accuracy of recall over time, specifically with regard to the number of errors noted in individual student performances.
The various song components and the types of movement instruction (locomotor, nonlocomotor) were analyzed with regard to number of errors in song-recall. The following research questions guided the research, and were used to structure the analysis and discussion of the variables and the effects of movement-based music instruction.

Research Questions

The current study was designed around four variables of interest: text, pitch, rhythm, and melodic contour. The research questions were:

1. Does movement-based instruction affect memorization and retention of text?

2. Does movement-based instruction affect memorization and retention of pitch?

3. Does movement-based instruction affect memorization and retention of rhythm?

4. Does movement-based instruction affect memorization and retention of melodic contour?

5. Does movement type (nonlocomotor or locomotor), used in the process of instruction affect memorization and retention of text?

6. Does movement type (nonlocomotor or locomotor), used in the process of instruction affect memorization and retention of pitch?
7. Does movement type (nonlocomotor or locomotor), used in the process of instruction affect memorization and retention of rhythm?

8. Does movement type (nonlocomotor or locomotor), used in the process of instruction affect memorization and retention of melodic contour?

The study is needed for several reasons, primarily to support existing research, and to provide additional information that is relevant to music education practices with young children.

Need for the Study

Memorization has been recognized as a critical aspect of the learning process. Specifically, in the process of learning a new song, it is very important for music educators to find out how to present new material to students so that they can learn it and remember it to the best of their abilities. As Amuah (1994) noted, “the term memory for music is often used by contemporary music psychologists to denote the ability to encode, store, and retrieve musical events, ranging from three- or four-note melodies, to familiar tunes” (p. 7).

A considerable amount of research has focused on investigating an individual’s memory for music. The primary research method has been to study the memorization of a
sequence of tones. This technique (identified by Berlyne, 1982) has the benefit of studying aspects of music learning in isolation, including pitch relationships (studied by Deutch, 1982) and melodic contour (studied by Dowling, 1982). However, the method falls short in that the sequence of two to twenty notes does not effectively mimic the rich patterns and relationships that make up music (Sloboda, 2005). Even though some of the effects of music come from these patterns and relationships, studying the memorization of tonal sequences will only result in partial understanding (Russell, 1987).

The relationship between memory for music and the performance experience has been empirically studied and well-documented. Almost all related studies revealed a strong relationship between memory for music and the music performance experience (Haack, 1992; Mitchell, 1985; Moore, 1984; Shuter-Dyson & Gabriel, 1981). Similarly, Amuah (1994), who sought to find the relationship between memory for music and aspects of musical behavior, concluded that previous musical experience enhanced the development of memory for music. Amuah defined this process as “the ability to remember musical excerpts” (p. 7). However, encoding and retrieval strategies, which are the main features of human memory, are functions of extended
practice and experience. Mishra’s (2004) position further proposed a model of musical memory as a fusion of three stages: preview, practice, and over-learning. In other words, one needs to know the music, work hard on technical problems, and blend ideas and technical skills.

The relationship between a memory for music and the listening experience has been addressed and examined by many scholars (Dowling & Bartlett 1981; Haack, 1992; Krumhansel, Bharucha, & Castellano, 1982). Inferring from Mursell’s (1931) study, Amuah (1994) proposed that musical understanding is dependent on one’s ability to remember and relate past to present musical events as a piece unfolds.

Another research tendency was to exclusively examine the mechanism of memorization in professional musicians (Ginsborg & Sloboda, 2007; Large, Palmer, & Pollack, 1995; Palmer, 2006; Sloboda, 2005). Based on the foci of previous research and a review of the understudied areas, this study attempted to examine the music learning process in a real classroom situation where students have had no real (or known) prior music experience. How do students learn best? How can music educators help students acquire musical knowledge and learn new song material? How long will they retain the new information? What type of instruction will help in the memorization and retention of song content?
In her report, Zimmerman (1984) stated that musical memory is directly related to musical activity, or movement. It is surprising then, that there is very little existing research on the relationship between movement and memorization of music; in fact, only one study examining the relationship between movement and memory for music (Taylor, 2000) has been identified. In Taylor’s study, students were asked to create either a verbal or kinesthetic (movement) description of a music selection. Results from the study showed that the kinesthetic strategy significantly improved student achievement on recognition tests taken one week later.

Developmental studies support the close associations between bodily movement, speech, and musical sounds (Papousek, 1996). For example, Papousek and Papousek (1981) stated that a so-called emerging-bodily-linguistic-matrix was observable in one-year-old infants. Rhythmic movements of their bodies, which include associated breathing patterns, as well as limb and trunk movements, accompany the rhythmic sequences sung by infants. These rhythmic body movements are closely related to rhythmic speech patterns. Furthermore, this emerging-bodily-linguistic-matrix is socially enhanced by adult-infant interactions (e.g., speech, or gesture) that connect bodily gestures to
emerging speech and musical sounds (Seitz, 2005).
Additionally, Trehub, Thorpe, & Trainor (1987) asserted that even prior to the first year of life, young infants are able to encode information about musical contour, pitch direction arising from small semitone changes, and beat structure; they are also able to differentiate small tone-quality disparities (Papousek, 1996).

One of the reasons, and a possible explanation for, the frequent use of movement in the development of rhythmic skills, may be found in the motor theory of rhythmic response. According to Lundin (1967), rhythms are perceived because the body contains a neuromuscular system that can be trained to react to rhythmic stimuli. Many studies have examined the role of movement-based instruction on rhythmic development in young children (Blasedell, 1991; Jordan, 1986; Joseph, 1982; Moore, 1984; Rohwer, 1998; Rose, 1995; Searle, 1985). Music instruction that included movement has shown positive influences on the development of rhythmic concepts and skills for elementary-grade students.

Another reason to incorporate body movements into the teaching of music is that the process of hearing is a physical phenomenon. When the eardrum receives sounds as audible vibrations, these sounds resonate through the body and cause natural body reactions (Juntunen & Hyvönen,
2004). Therefore, according to Juntunen and Hyvönen, humans listen to, and understand, environmental stimuli with the whole body; humans naturally and physically respond to sound.

In her extensive research of existing literature, Dura (2002) also postulated that music is both heard and felt at the same time. Through music and movement instruction, students are taught to listen to their bodies; they are further invited to connect with the self through a personal response to the music.

Movement activities have also been used to teach musical skills and concepts to older students. A few studies have explored the use of movement-based instruction in choral settings (McCoy, 1986; Wis, 1993). Several scholars (Andress, 1991; Metz, 1986; Sims, 1985; Snyder, 1986; Wis 1993) explored the depth of children’s movement responses, as well as their ability to communicate the interpretative aspects of music through movement.

In a study done by Shiobara (1994), music was used as a means to enhance musical understanding in primary-grade students. She claimed that music and movement activities help students to develop a music schemata, which allows them to build a better understanding of the expressive characteristics of music. Additionally, Cheek (1979)
reported that students taught with movement instruction showed an improvement in self-concept and a more positive attitude toward participation in musical activities.

Although movement has been documented as a useful learning strategy, Dura (2002) argued that scholars have largely neglected movement as a natural, physical response to the auditory experience: “While the spatial and visual aspects of music listening are increasingly subjects of study, the kinesthetic aspect is often overlooked, and often even degraded” (p. 8). Hannaford (1995) speculated that this notion could be part of a societal prejudice, which tends to downplay physical achievement and divorce the mental from the physical faculty.

Existing research has focused on the use of movement as a tool to aid in comprehension of various musical elements, or to improve student achievement, or to express the inner self. Despite existing research, very few studies have specifically examined how movement-based instruction can impact the way children learn and retain new song material, as well as other important educational concepts (e.g. literacy, problem-solving).

Additional research is needed to explore the effects of movement-based instruction on song-learning. Furthermore, if results from the current study are found to
be significant, specifically with regard to the relationship between movement and song memorization, then the outcomes can be used to inform future teaching practices. Educators can begin the process of conceptualizing and defining more age-appropriate music education practices that can help improve song learning and retention. This practice is important in shaping the future of music education.

Based on the existing literature it could be concluded that there is a triadic relationship between physical movement, memory for music, and music learning. The current study was designed to gather more information about this specific movement-memory-learning relationship among first-grade-students. The following chapter will review the literature that is currently available on the topic of music, memorization of music, and movement.
CHAPTER II

REVIEW OF LITERATURE

Movement

I hear and I forget
I see and I remember
I do and I understand
- Chinese proverb

Movement, as a natural part of children’s lives and as one of the major responses to music, has been widely studied by scholars and music educators. The term “movement” describes both internal and external action and encompasses every kind of motor behavior, from the response of the whole body, to the gross and fine motor skills required to perform complex tasks (Taylor, 2000). Movement occurs even before birth. In the prenatal environment, the mother’s heartbeat may represent the first rhythmic experience. Moog (1976) reported that at the age of six months, infants use unsynchronized whole body movement to respond to music. At the age of approximately two years, children use their leg and arm movements, and temporary synchronization occurs. For children, music and movement seem to be synonymous (Zimmerman, 1984).
Movement is the primary means of communication for children. Movement symbolizes their natural response to music and is vital to early childhood musical experience. Prior to language development, children use physical movement and sound to communicate with others. According to Hannaford (1995), children use movement to learn how to listen and interpret, respond, and explore. Movement activates and integrates connections in the brain, thus enhancing the learning process.

Most of western philosophy, at least from the time of Plato, has favored a mind-body dualism, which elevates the mind and cognitive (or rational) functions over the body. This metaphysical view reached its peak in the early modern era with Descartes' "Cogito ergo sum," in which he equated being with thought, and argued for the existence of two fundamentally different (and ultimately incompatible) substances: immaterial minds and material bodies.

As early as 400 B.C., the human body was shown to have a critical impact on other types of development. For example, Socrates (as cited in Kirkendall, 1985) studied and found that physical health and personal care of the body had a strong influence on the development and function of the mind. The intertwined functions of the mind and body led to philosophical conclusions that the holistic
individual is actually a solid balance of the mind and the body. Further, researchers proposed that they were so interrelated that the “mind and the body are not separate entities, nor does the mind consist of independent faculties or elements and the body of independent organs and processes. The organism is a single unity” (Hall, Lindsey, & Campbell, 1998, p. 297).

Some philosophers propose that the mind and the body are constantly affecting each other. As Levin (1988) argued, “the disembodied experience and individualistic conception of the human being is not only a philosophical construction but is lived through in western culture” (p. 96). Even music in the western world has succumbed to this metaphysical bias of mind-body dualism by being understood as something cognitive or intellectual, instead of a unified bodily experience. With Dalcroze’s attempt to develop musicianship defined as embodied action, a whole new approach in the field of music education began to emerge.

Campbell (1991), in her historical study (of movement in music education), explored the development and role of movement in the public schools in the United States. Music instruction in American society at the beginning of the 20th century was primarily based on singing in tune. Rhythm was
considered a less important element of music, and elementary students were taught only how to sing well and read notation fluently. With the acceptance of John Dewey’s child-centered curriculum and with the appearance of Dalcroze Eurhythmics, movement in education gradually entered the music curriculum. Movement was recognized as a natural response to music, especially to rhythm activities, and thus became widely accepted by music educators, securing its place next to singing and listening in the general music curriculum.

Dalcroze (Dalcroze, 1976; Mead, 1994), Kodály (Choksy, Abramson, Gillespie, Woods, & York, 2001; Houlanahan & Tacka, 2008), and Orff (Choksy et al., Warner, 1991), as well as Gardner (1999, 2006), supported the importance of movement to the learning process. They all shared the belief that movement was an essential link to learning and thinking processes. As Hannaford (1995) put it: “Thinking is a response to our physical world . . . movement is an integral part of all mental processing, from the atomic movement that fires the molecular movement that orchestrates the cellular (electrical) movement, to the thought made manifest in action” (p. 107). Hannaford also explained that movement activates the body’s neural wiring, and thus the whole body becomes a learning instrument. As a
child moves, speaks, writes, or sings, muscles are used, and the child establishes neuromuscular and cognitive pathways. Skills, which are the building blocks of learning, are mastered through muscle movement.

There is plenty of evidence to support the idea of a tight mind-body connection, specifically that the mind and body are constantly interacting with and affecting each other. Hancock (1996), for example, offered an explanation from a physiological standpoint. The development of the brain is dependent on nutrients that are produced by the body. These nutrients, such as glucose produced during physical activity, are the key components that strengthen nerve centers that are necessary for learning, the memory, and making connections between different pieces of information.

Consequently, recent research suggested the relationship between physical education and academic achievement. Chomitz, Slining, McGowan, Mitchell, Dawson, & Hacker (2009) reported that physical fitness and physical activity may have positive effects on cognition and concentration as well as on learning and memory. This could be explained by the fact that physical activity is consistently related to higher levels of self-esteem and
lower levels of anxiety and stress (Ekeland, Heian, Hagen, Abbott & Nordheim, 2004).

In addition to the critical role of the body in the learning process, the mind has been studied in depth as well. Information from the field of physiology provides insight into brain functioning and the mechanisms of memory. However, the role played by physical experience in organizing and memorizing various concepts can be explored from the position of psychology. Information offered by psychologists through their observations and research provides explanations of those processes as part of a child’s functioning. The importance of physical experience has been emphasized in the theoretical work of Jean Piaget (Abeles, Hoffer, & Klotman, 1995), Howard Gardner (1999, 2006), and Jerome Bruner (1966). These theorists have greatly influenced educational theory and practice.

The Swiss psychologist, Jean Piaget (Abeles et al., 1995), who developed one of the most influential theories of cognitive development, emphasized the importance of the physical experience as an essential source of learning. He argued that infants do not acquire knowledge from facts communicated by others, or through sensations and perceptions. Instead, Piaget suggested that knowledge is the product of direct motor behavior. He also proposed that
all children move, in a fixed sequence, through four major stages of cognitive development.

In the sensorimotor stage, which has six sub-stages, intelligence is demonstrated through motor activity without the use of symbols. Piaget believed that during this stage all knowledge is acquired through physical interaction with the environment (Abeles et al., 1995). Generally, knowledge is gained through experience and exploration and is entirely dependent upon bodily involvement. Gradually, this interaction with the environment develops into a "sensorimotor intelligence" that is based on repeated experience (Piaget & Inhelder, 1969). The child’s experiences with objects, people, and the body, become the basis for further development. “It is during this time that the child constructs all the cognitive substructures that will serve as a point of departure for his later perceptive and intellectual development” (Piaget & Inhelder, p. 3).

The implications for teaching young children are that teaching methods should be designed around the child’s existing skills of thinking in concrete terms, particularly for new material. These findings indicate that teaching with physical movement could be valuable because of its concreteness and its multi-sensory nature, since movements are both felt and seen (Taylor, 2000).
Other influential thoughts and theories came from Howard Gardner (1999; 2006), who proposed a theory of multiple intelligences. Gardner questioned the idea that intelligence is a single entity resulting from a single factor. He postulated that “in the classic psychometric view, intelligence is defined operationally as the ability to answer items on tests of intelligence” (2006, p. 6). For Gardner, intelligence is “the capacity to solve problems or to fashion products that are valued in one or more cultural settings” (1999, p. 33). After several years of work with multiple intelligences, Gardner updated his definition, suggesting that “… an intelligence is a bio-psychological 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” (p. 33-34).

Within his theory, he originally outlined a list of seven intelligences, including linguistic, logical-mathematical, musical, bodily-kinesthetic, spatial, interpersonal, and intrapersonal intelligences. In the refining of his theory of intelligence, Gardner proposed two more intelligences that individuals possess, including the naturalist and existential intelligences (Gardner, 2006).
Among the nine distinct kinds of intelligence, the two that are of particular importance for the present study are the musical and bodily-kinesthetic intelligences. Musical intelligence includes a unique aptitude for music in terms of performance, composition, recognizing musical patterns, and music appreciation. Music is often (or traditionally) considered a talent, rather than an intelligence, while linguistic skill has been clearly linked to intelligence; however, Gardner’s theory suggests that the structures of musical and linguistic intelligences are nearly parallel to one another (Gardner, 1999). Within musical intelligence, individuals create sound, communicate through sound, and understand the meanings behind a variety of sounds; this emphasis on using sound as a way of communicating matches the skills associated with linguistic intelligence, but with a more specific focus.

Among the other kinds of intelligence, the bodily-kinesthetic intelligence is also important for the current study. Recognizing the relationship between the thought process and movement, Gardner stressed the importance of bodily-kinesthetic intelligence and described it as “the potential of using one's whole body or parts of the body to solve problems” (Gardner, 1999, p. 42). He explained bodily-kinesthetic intelligence in terms of the way in
which an individual learns to interact with the environment, similar to Piaget’s sensorimotor stage. Gardner also believed that the bodily experience serves as the basis for all knowledge.

There are several points about Gardner’s intelligence theory that are especially important for educators to consider in creating effective music education practices. First, although Gardner has identified and changed the specific kinds of intelligence throughout the course of his theoretical development, Gardner has consistently noted that the most important aspect of his theory is that intelligence should be observed as multi-faceted approach to understanding human intelligence. This notion goes against prior thinking about intelligence that could be defined by g or general intelligence quotient which represented a single factor of intelligence. As a result of this progressive way of thinking, Gardner identified several different kinds of intelligence that make up an individual’s intelligence profile.

Second, in addition to multiple intelligences, Gardner was clear in suggesting that all individuals possess all the intelligences to some degree; individuals differ in the strength, aptitude, and ability level for each kind of intelligence. In this respect, learning should not focus
only on the individual’s learning and intelligence strengths, but should offer encouragement to students to improve intelligences that may not be as strong. Curriculum and instruction should include opportunities for learning and improvement with the different intelligences.

Finally, a third nuance stems from the theory’s focus on real-world-roles. Each real-world-role is comprised of a combination of intelligences. Different occupations, different jobs, and different life roles require different intelligences at different times. In many cases, the intelligences work in conjunction to manage tasks effectively. Each of the intelligences contributes to real-world-success.

This theory is relevant to the current study in that multiple intelligences are activated and are required in the accurate processing of music content. Music learners must listen, communicate, and understand the patterns of sound that occur in music. In music learning, the body can be considered a vehicle of expression that supports the processing of sound. Several of the other intelligences could also be considered as relevant to the music learning process. The information provided by Gardner has informed the design of the current study and the overall philosophy behind the goals of the research.
In viewing physical movement as a way of kinesthetically, tactiley, and visually representing a musical idea, Jerome Bruner's (1966) theory of instruction is highly relevant. From a psychological standpoint, Bruner focused on the nature of instruction, and the means by which educators assist in a student’s intellectual growth. Bruner put forth three modes of representation through which an idea or event is demonstrated: the enactive (appropriate motor response); the iconic (internal imagery of a set of summary images); and the symbolic (oral or written symbols or notation). According to Aronoff (1979), physical movement in music teaching links the enactive and iconic modes identified in Bruner’s theory.

Beyond an understanding of developmental and learning theories as they relate to music education practice, several pedagogical experts (e.g., Dalcroze, Kodály, and Orff) have subscribed to the idea that all knowledge is acquired through experience. These pedagogical beliefs support movement instruction as a primary step in the many-sided process of learning music (Choksy, et al., 2001).

Probably the most well-known method for utilizing movement as an essence of music instruction is known as Dalcroze Eurhythmics (Mead, 1994). “The essence of eurhythmics is the spontaneous and individual realization
Dalcroze viewed the body as the first and most important instrument. He postulated that the body can perform any musical idea. Similarly, any movement of the body could be transformed into musical sound (Choksy, et al., 2001).

One of the most important Dalcroze contributions was the explanation of the kinesthetic process. He assumed that each body movement resulted in some kind of feeling, which is sent through the nervous system to the brain. The brain further translates this feeling into sensory information (perception) about the bodily position and movement of the muscles, and assesses it. In order to protect the organism from injury, the brain sends directions to the body (through the nervous system and back again) to react in a certain way. This process is known as kinesthesia, or the kinesthetic sense.

Choksy, et al. (2001), offered an explanation of the process of kinesthesia, as an essence of Dalcroze’s method: “Hearing could be linked to moving; movement could invoke feeling; and feeling could trigger kinesthetic sensing to bring information directly to the brain and then back to the body via the nervous system” (p. 46). The final goal of Dalcroze’s Eurhythmics is that “sound becomes physical
memory” (Choksy, et al., p. 135). In this respect, sound and movement combine to create a memory for music.

Carl Orff, a German composer and educator, was influenced in his early years by the work of Dalcroze (Choksy, et al., 2001). His interest in children’s education began with his love for dance. Orff developed his own elemental approach of teaching music while he was music director of a school of dance and music in Munich known as the Günther-Schule. Like Dalcroze, Orff believed that the natural rhythmic movements found in children’s play were the basis for children’s growth as well as for musical development.

He outlined four specific body movements as basic in the Schulwerk: finger snapping, clapping, stamping, and patschen (clapping the hands on the thighs). These movements are used to accompany musical actions such as singing and chanting. Orff and Dalcroze both considered the body as the most important instrument. Therefore, the exploration of space through movement is emphasized as the fundamental component of Orff’s process.

Choksy, et al. (2001) theorized that movement could serve as a means to awaken musicality. The exploration of the form is enabled through various dance movements, since dance consists of different patterns, which constitute
different forms. In the Orff approach, the teacher serves as a role model for students to observe and then imitate. At each step in the process the students move from imitation to creation, from part to whole, from simple to complex, and from individual to ensemble (Choksy, et al., pp. 107 - 109).

As the understanding of music education and its importance grew, music became more accessible to the general public. For example, Zoltan Kodály (Houlahan & Tacka, 2008) believed that music was not just dedicated or reserved for the musical elite, but music should be enjoyed and learned by anyone and everyone. He also believed that “with a few years of technical preparation, children can achieve results measurable by the most exacting of absolute artistic standards” (Houlahan & Tacka, p. 19).

Kodály suggested that music performance should be at the core of any music program because students would be able to engage in a combination of processes that could enhance learning, including singing, movement, playing instruments, and conducting. Kodály thought singing was beneficial because it allows children to internalize sound, and singing also provides them with immediate and direct participation in the musical experience. Additionally, Kodály also used methods like singing games and folk
dancing to foster the musical development of children (Houlahan & Tacka, 2008).

Kodály used movement as one of the important components of his music teaching method (Choksy, et al., 2001), but with less emphasis on exploration. Particularly, during the singing process, children tap or pat to the beat of the song. They also model the melodic direction through the use of creative movements that illustrate their understandings of high/low or fast/slow. When learning rhythm patterns, students also clap, tap, or express their perception of music through a variety of body movements.

Singing, which is considered as the most important aspect of the Kodály approach, is coordinated with movement (i.e., simple body movements in rhythm to the words or to the beat). Kodály teachers know about children’s normal development because the child developmental approach is one of the most important features of this method. The teaching material must be within the child’s potential, or developmentally appropriate for the age of the child.

A developmental approach to music education was supported by Choksy et al., (2001), who described the process as a sequencing of instruction this should be employed whereby children progress from nonlocomotor
movements (movements in place) to locomotor movements (movements in space). As a final stage, children learn to use movement in dance, proceeding from circle to standard dances. Another technique used in the Kodály method engages the use of hand signs in order to represent different scale degrees. The hand signs, which could be considered gesturing, assist students in visualizing different pitches and in determining their direction.

As an offshoot of Choksy's work, research confirms that gesturing aids listeners in communicating, and speakers in thinking (McNeill, 1992; Goldin-Meadow, 2003). Studies involving the role of gestures support the notion that the body plays a key role in the formation of complex and abstract concepts and ideas (Nicoladis, Mayberry & Genesee, 1999; Leiner, Leiner, & Dow, 1993). In this case, gesturing aids in the formation of the pitch concept.

It is evident that each of the methods and approaches used in music education described above has unique characteristics and yet some overlapping features; natural and humanistic approach, child-centered curricula, and personal knowledge are obtained through individual experience and discovery, and a learner's process of moving sequentially from the known to the unknown. Movement is recognized as a central component to each of these methods,
but the amount of emphasis placed on movement and the balance between free exploratory movement and structured, refined movement varies from one to the other.

Several other researchers acknowledged the effectiveness of movement in music instruction. For example, Radocy and Boyle (2003) discussed the importance of movement, specifically feedback from the muscles, and referred to its connection with the development of musical abilities. They concluded that, "Neuropsychological findings support the contentions that sensory feedback from movement is related to higher mental processes" (p. 153).

With a slightly different approach, Dura (2002) focused on the phenomenon of felt movement during music listening. The author sought to answer the question, "How, precisely, does music produce a sense of movement in the listener experiencing that music?" (p. 4). The kinesthetic dimension of the music listening experience was examined through an analysis of relevant literature from the fields of philosophy, psychology, neurology, music theory, and music education. Dura concluded that:

There appears to be a biological basis for a connection between music listening and perceived movement through parallel and distributed neural processing, where incoming stimuli are directed to various specialized areas of the brain before impulses are reunited into a single representation. (p. 255)
The author also emphasized the role of physical metaphor as essential in associating the patterns of music with the patterns of life and movement, which is related with Wis' (1993) findings. She proposed that bodily based experience could represent a foundation for abstract cognitive operations in the process of learning music.

Lakoff & Johnson concluded (as cited in Juntunen and Hyvönen, 2004) that: “(1) cognition is not only inseparable from, but also dependent upon, bodily experiences, and (2) that metaphor provides a link between the concrete, bodily domain and the abstract, conceptual domain” (p. 205). In the light of this idea, metaphor is viewed as a fundamental, not a derivative, mode of human understanding.

According to Wis (1993) and Juntunen and Hyvönen (2004), two domains of the human experience - the concrete and the abstract - are joined together in metaphor in order to enable the acquisition of new musical knowledge. The similarities shared by both domains bond them together and make a metaphoric connection possible. Since, according to Matthews (1994), metaphor implies bodily engagement, in order for there to be new knowledge the metaphor must engage with this store of bodily experience. Furthermore, the association between bodily experience and metaphor must be culturally relevant, which means that when approaching a
musical concept via metaphor, one has to find bodily movement that is meaningful within the particular musical culture. Delis, Fleer, and Kerr (1978) found that attaching meaningful associations to pieces of music improves recognition memory.

In a recent neuroscientific study of memory for music performance, Palmer (2006) suggested that brain imaging measures collected during mental practice or listening tasks, demonstrated that both motor and auditory cortical areas are active during the musical thought processes. Four lines of behavioral studies with performers revealed motor-based representations: performers' musical interpretations, transfer of learning from one musical task to another, mental practice effects, and anticipatory movements. This led to the conclusion that an accurate auditory and motor representation underlies successful performance from memory.

Accurate auditory and motor representation is channeled into the idea of an embodied mind, where Seitz (2000) introduced a new model of the relation of movements to thoughts. This model blends the boundaries between and among perception, action, and cognition. Seitz further explained that human consciousness is not just a mental activity, but rather it is a combination of the body's
"awareness" of itself and its cognitions. He concluded that ". . . body structures thought, as much as cognition shapes bodily experiences" (p. 36).

It has been recognized through research that human motor capacities can address long-standing questions in their psychological domains, such as the nature of human learning, memory, planning, and categorization. Seitz (2000) carefully explored the nature of the thinking process and tried to explain how the brain gives rise to mental states that "represent" the external world (p. 25). Based on the findings from neuroscience and the social and cognitive fields, perceptual and motor faculties form the foundation for intellectual capacity such as "metaphoric, imagistic, and schematizing abilities" (p. 25). Furthermore, Seitz concluded that "these capacities rest on a biological infrastructure" (p. 26).

The brain and the physical/motor functions it embodies are dependent on both the internal world of cognition and the external environment for fundamental operations such as movement and thought (Satio, 1996). Therefore, motor logic, motor organization, kinesthetic memory, and kinesthetic awareness represent the central part of the operation of the motor system. Seitz proposed three cognitive capabilities that are central to the bodily basis of
thought: motor logic and organization, kinesthetic memory, and kinesthetic awareness. Motor logic, or Seitz’s “syntax of movement,” is physical movement framed by the expression and ordering of movement. Kinesthetic memory is the ability to imagine muscle movements and positions. Kinesthetic awareness is the processing of information received from proprioceptors in muscles and tendons such as posture, movement, balance, and awareness of the place, resistance and heft of objects outside of the body. Indeed, Reed (1982) concluded that movement and thinking do not exist in cognitive and biological vacuums and that sensory systems guide our movements and thoughts.

Action (movement) is not only a final product of thinking. Elliott (1995) proposed that we think through performing music, and that musical performance is not a product of something we call thinking. His notion of “thinking-in-action” associates musical understanding with musicianship in its various forms. Juntunen and Westerlund (2001) examined Elliott’s idea in relation to Dalcroze’s postulation and explored the function of the body in relation to music and movement. They presented the idea that “the body can be taken as a conscious object of transformation within a framework of ‘holistic duality’ rather than dualism” (p. 201); that is, the body is our
principal means of knowing. “We do not simply inhabit our bodies; we literally use them to think with” (Seitz, 2000, p. 23). They further explained that a human organism functions as a whole and that mind and body could not be separated from that entirety. Whether there is an awareness of it or not, the body is engaged with musical sounds by feeling, sensing, and experiencing. Juntunen and Westerlund (2001) hypothesized that “the development of musicianship happens in action, through action, and within action” (p. 204). This idea is not an essentially new one. Dalcroze questioned the relation of body to musical understanding a century ago, and although his intention initiated a practical quest, it served as basis for the development of new transformative and experiential view.

Juntunen and Hyvönen (2004) examined how bodily experience, within the framework of Dalcroze Eurhythmics, can facilitate musical knowing. They found support in the philosophical ideas of Merleau-Ponty (2002), who postulated that one comes to know the world through the body (i.e., gesture, habit, and reversibility). Juntunen and Hyvönen, along with Merleau-Ponty, shared the belief that the body is a primary mode of knowing. Additionally, Juntunen and Hyvönen suggested that body movement represents “pre-
reflective knowing and can be understood as physical metaphor in the process of musical understanding” (p. 200).

It has been recognized that the musical thought process is strongly related to physical movement. Recent studies also suggest that melodic, rhythmic, and harmonic motions arise from different sources within the brain-body axis (Repp, 1993). Consequently, the essence of Dalcroze’s Eurhythmics is “the connection of body and mind through aural and physical sensation,” and thus the final goal was that aural experience becomes a “physical memory” (Choksy, et al., 2001, p.135). In order to examine the nature of memory for music, the mechanisms of the memorization process are examined.

Memory

What is memory? As Levitin (2002) pointed out, people have an intuition about what memory is until they are asked to define it. According to Radvansky (2006), memory is the most central aspect of human thought, a very personal and intimate trait that defines each individual. There is no simple and direct way to talk about memory and how it works. Wolfe (2001) postulated that memory is the retention of information over a period of time. In order to retain the information, one must be able to perceive it, store it, retain it, and later recall it. Wolfe concluded
that it is memory that enables us to learn by experience (Wolfe, 2001); that is, “memory processes are acts of using information in specific ways to make it available later or to bring back that information into the current stream of processing, the flow of one’s thoughts” (Radvansky, 2006, p. 1). Guenther (2002) labeled this observation of memory as the record-keeping approach. The main idea behind any record-keeping theory is that memory functions as a kind of storage bin in which records of experiences are placed, just like books might be placed in a library.

There are several ways of classifying memories, based on their duration, their nature, and the retrieval of information. From an information-processing perspective, there are three main stages in the formation and retrieval of memory: (1) encoding, which could be explained as processing information into one's memory, (2) storage, which is the creation of a permanent record of the encoded information, and (3) retrieval/recall, or calling back the stored information in response to some cue for use in some process or activity. There are, however, three types of encoding: (1) visual encoding, which refers to the processing of images, (2) acoustic encoding, which is the processing of sound (particularly the sound of words), and
(3) semantic encoding, which refers to the processing of meaning (e.g., the meaning of words).

Wolfe (2001) explained that brain areas such as the hippocampus and amygdala are thought to be involved in certain processes of memory. While the thalamus plays a critical role in regulating perception and the body’s vital functions, the hippocampus is believed to be involved in spatial learning and the retention of immediate past. It is also hypothesized that the hippocampus is responsible for dispatching the memory to the cortex, where it is stored in what is called long-term memory.

Short-term memory, sometimes referred to as “primary” or “active” memory, is the part of memory that stores a limited amount of information for a limited amount of time (roughly 15 - 45 seconds). In order to retain information for a longer period of time, information must be periodically repeated, or rehearsed, either, by articulating it out loud, or by mentally simulating such articulation. The second feature associated with short-term memory is that it has a limited capacity. Miller (1956) argued that human short-term memory has a capacity of approximately seven items, plus or minus two. Miller also argued that the unit of measurement for short-term memory capacity is a chunk. A chunk can be a single digit or
letter, or it can be a word, a multiple-digit number, or even a whole phrase if the number or the phrase combines with a unit that has already been stored in the long-term memory.

It is generally believed that some or all memories pass from short-term to long-term storage after a brief period. The process of reorganizing and transferring information from short-term memory to long-term memory is known as recoding (Abeles, Hoffer, & Klotman, 1995). Another important aspect of remembering is the process of retrieving. As long-term memory is subject to fading in the natural forgetting process, several recalls/retrievals of memory may be needed for long-term memories to last for years. Abeles, et al. (1995) suggested that in order for information to be easily retrieved, it has to be organized and stored systematically. Condensed information is more easily retrieved from memory. The authors further advise that the use of retrieval cues will enhance retention, and thus the memorization, of large amounts of information.

Memory research that focuses on the complex mix of thoughts, perceptions, emotions, and reasoning that make up the mind, rather than on the physical and chemical structure of the brain, may be of particular value to educators. When such research is conducted in an
educational setting, it is even more valuable, since it provides insight into the educational process as well as the mind. Understanding the educational process in terms of developmental strategies is critical.

Strategic remembering develops during the preschool years. Mother-child social interactions and other socialization practices might provide the foundation for the development of skills necessary for effective organization of information in memory. Larkina, Guler, Kleinknecht, and Bauer (2008) conducted a laboratory study in which 48 mothers and their 40-month-old children were engaged in the process of remembering related pictures through study and recall. The study found that children’s memory was enhanced by maternal, verbal, and physical behaviors that focused on the organization of items, such as sorting items and naming the categories. Some mothers used different mnemonic techniques that emphasized categorical connections among items, suggesting that mothers use systematic approaches in helping their children learn effective ways of remembering.

Schwenck, Bjorklund, and Schneider (2009) studied different strategies (sorting, clustering, and multiple strategies) in the remembering process of children between the ages of four and eight. As expected, older children had
higher levels of recall and used recall strategies more often than younger children. However, even four-year-olds used multiple strategies in the memory tasks. In general, the study showed that clustering is a strategy that develops early but is not the most effective, whereas the use of multiple strategies, especially sorting, is used by older children more frequently and more effectively.

Additional memory studies have offered new information. For example, Riggins, Miller, Bauer, Georgieff, and Nelson (2009) used behavioral and electrophysiological measures to assess the development of memory for contextual details (e.g., temporal order). They showed that although the ability to recall contextual details associated with an event begins to develop in the first year of life, mature levels of recall are not reached until early adolescence. Memory for temporal order improved with age, despite similar levels of memory for individual items.

Research on meta-memory involves understanding the variables that influence how likely a person is to remember something and an understanding of why people occasionally misremember things. In a study by Jaswal and Dodson (2009), five- and six-year-olds were asked to decide whether another (fictitious) child’s mistakes in a memory game were
due to false memories or guesses. Six-year-olds consistently attributed more similar than dissimilar mistakes to false memories than did five-year-olds, which leads to the conclusion that understanding the link between similarity and false memories improves significantly between five and six years of age.

Developmental differences in memory capacities were also studied by Quas, Malloy, Melinder, Goodman, D’Mello, and Schaaf (2007), who investigated what kind of developmental differences in the effects of repeated interviews and interviewer bias on children’s memory and suggestibility. Three- and five-year-olds were interviewed once or repeatedly about an event by either a highly biased or a control interviewer. Children interviewed once after a long delay by the biased interviewer made the most errors. Children interviewed repeatedly, regardless of interviewer bias, were more accurate and less likely to make false claims.

Additionally, in free recall tests, among children questioned once after a long delay by the biased interviewer, the five-year-olds were more likely than three-year-olds to imply a falsity in response to direct questions. Interestingly, three-year-olds were more easily manipulated into making a false claim. The findings
suggested that interviewer bias was particularly problematic when a child’s memory has weakened. In contrast, repeated interviews held a short time after an event did not necessarily increase children's errors, even when interviews included misleading questions and interviewer bias.

Memorization often includes (but is not limited to) rote learning, which is a method of learning that conditions an individual to recall important information literally. Rote learning involves repetition. It has been hypothesized that an individual can learn a necessary amount of information through repetitive action, to the point that it becomes near-automatic. These repetitions are called mental rehearsals or ways of organizing the information (Abeles, et al., 1995). The authors further compared memory to file cabinets in which people store papers and information. When those files become full, or if they are not used, they become forgotten. Thus, organizing the information through mental rehearsal is analogous to “spring cleaning” of the file cabinets. Storytelling or mnemonic devices increase the efficiency of memorizing items such as words.

In this digitized and computerized age, memorization has become a dirty word in education circles, as Weems de
Graffenried (2009) noted. With all kinds of information being just one click away and with today’s trend to let electronic devices memorize, it is logical to conclude that humans do not use the brain as before. However, memorization of information is still a useful skill. Baurelein (2009) recognized this potential risk and misunderstanding of the memorization of verse (or any other kind of utterance). Memorizing musical pieces for a performance is common among (professional) musicians and can aid in the accurate recall of song material. Memorization can also help expand vocabulary, and can build confidence in students who are learning the art of public speaking. In the process of memorization, it could be said that the human memory works like a muscle; the more you use it, the stronger it gets. Improving memory takes practice or rehearsal; tricks and mnemonics can support the processes of memorization and retention.

According to the Merriam-Webster’s Dictionary (2009), a mnemonic is defined as a tool designed to facilitate memory. Such a tool or device could be a formula or rhyme used as an aid in remembering. Mnemonic instructions can be effective tools in the classroom and are frequently used by educators to facilitate students’ memorization and recall of information. Imagery and visual cues are mnemonic
strategies that help students better encode information so it is easier to recall later. Verbal, rhythmic, and musical prompts can also help students who have difficulty retaining or retrieving information. Students with learning difficulties also found mnemonic instruction beneficial.

Memory tricks have been the focus of additional research. Carter (2009) recently offered insight into cognitive processes and suggested new paths for researchers. Carter recognized the capacity of the human mind to establish an architectural filing system and called scholars to shift cognitive organization from the computer screen to the mind. He synthesized the mnemonic techniques of the past, such as mind maps, metaphors, and narrative theory and compared this combination with the process of research thinking. Three useful observations emerged: concrete images can be used to conceptualize the abstract, mental architecture is used to conceive of structure, and the cognitive structuring process is ontologically significant.

Saber and Johnson (2008) examined the effectiveness of verbal repetition and first-letter acronyms in teaching a common marketing framework to undergraduate students. Students were tested for unaided recall of the concepts as well as concept application and analysis. Results indicated
that the use of acronyms as a mnemonic increased student scores for both unaided recall and concept application and analysis, while verbal repetition had no significant effect, either alone or in combination with the acronym strategy.

Music as a mnemonic device has long been understood to be a positive and effective means of learning, especially for younger students. However, Hayes (2009) noted that there is little research to support this belief. To fill the gap and provide more information about use of music as a mnemonic tool, Hayes examined the effect of musical and rhythmic mnemonics on the memorization and recall of facts and information in elementary school students. Experiments were conducted in three grade school classrooms, where students were taught songs containing academic content relevant to current curriculum areas. Students were interviewed about their experience and tested on subject-matter retention.

Hayes (2009) also surveyed teachers to gather information about the effectiveness of musical mnemonics as a tool in the classroom and the frequency of their use. Generally, the use of rhythmic and musical mnemonics was considered to be an attractive and innovative alternative instructional and learning strategy. However, Hayes
concluded that a mnemonic device should include music that is familiar to the participants in order to be effective.

To provide details of the effect of musical mnemonic instruction on long-term memory, Rainey and Larsen (2002), carried out two separate experiments. The first experiment tested the assumption that lists of unconnected names could be memorized more quickly when set to a familiar melody than when learned without music. Participants learned the list of names in the same amount of time, regardless of the memorization procedure (music vs. no-music). Nevertheless, results of the second experiment revealed that the type of memorization process influenced participants’ responses. Participants who learned the text with music took fewer trials to accurately recite the list than the others and retained the new information for a longer period of time than participants who learned the text with simple prose.

The results of these studies about music as a mnemonic device revealed that there was no difference in recall between the singing and the speaking group; the participants learned the list of names in the same amount of time.

Information about the brain, brain functions, human memory, the retrieval process, and various other related topics can be gathered from a variety of different
disciplines, including the field of physiology. However, the discipline of psychology provides a more comprehensive explanation of the learning process, how the brain and the memory work, and the significance of the physical experience in organizing various concepts for immediate, short, and long-term memorization purposes. Through extensive research, psychologists have been able to provide multiple, relevant conclusions about the mental processes of young children. As a result of these helpful psycho-educational conclusions, additional references will include psychological materials that have informed the current research.

Development of Memory for Music

The modern view of memory is that it operates via information of a variety of brain components. Different types of neural structures are used for different types of memory. Memory for music, just like memory for lyrics or pictures, most likely encompasses different cognitive subsystems to encode the various aspects of music. Scholars agree that memory serves a dual function: it abstracts general rules from specific experiences, and it preserves, to a great degree, some of the details of those specific experiences.
The way in which musicians approach a piece of music is determined by training, experience, and learning style (Sloboda, 2005). Mishra (2003) proposed a model of musical memory as a fusion of three stages, namely Preview, Practice, and Over-Learning. That is, one needs to know the music, work hard on technical problems, and blend ideas and technical skills. Additionally, she outlined four processing strategies as segmented, holistic, serial, and additive. Each of the foregoing strategies can be successfully utilized in the memorization process, but it is still unclear whether the use of one strategy, or a combination of strategies, results in a more competent, useful, or secure memory.

In addition to the factors that relate to memorization, various learning styles need to be taken into account because preferred learning styles can impact the memorization process. Generally, the four well-known memorization strategies have been classified by Mishra into sensory (aural, visual, and kinesthetic memory) and analytical learning style. Aural memory is described as the ability to read the music; that is, the ability to hear the notes of a piece of music without relying on the sound source. Visual memory is the capability of bringing to mind a mental picture of musical notation, or visualization of
finger patterns on an instrument, while kinesthetic memory relies on muscular movements engaged in musical performance. The sensory learning strategy of choice for a performer is dependent upon the individual’s preferred learning style.

A music performance is a complex process, which includes cognitive, psychomotor, and affective elements (Taylor, 2000). It embraces the following seven perceptual attributes: pitch, rhythm, tempo, contour, timbre, loudness, and spatial location (Levitin, 2002). When memorizing a song, an additional dimension is added to the task: the lyrics. The question is to what extent do we remember all the details of a song? What do we remember first: the lyrics, the melody, or maybe both?

Crowder, Serafine, and Repp (1990) showed that memory representation for both lyrics and melody create a certain relationship in our minds. They referred to this relationship as the integration effect and claimed that “recognition of the melody (or text) of a song is better in the presence of the text (or melody) with which it had been heard originally than in the presence of a different text (melody)” (p. 469). Crowder, et al. (1990) offered two explanations of this phenomenon. First, the integration effect occurs as a result of association by contiguity,
which means that any two events become connected in memory if they occur in close temporal proximity; by the same idea, if one component is changed, it no longer offers the same retrieval cues for the other component. Secondly, the integration effect occurs as a result of physical interaction, where one component of a song exerts delicate but memorable physical changes on the other component. For example, when the words of a song are altered, the melody, as well as rhythm, undergoes subtle changes.

In a recent study, Ginsborg and Sloboda (2007) examined the nature of the relationship between words and music in memory and revisited the integration effect. They defined memory in terms of production, stating that memory was a “recall that involves singing both the words and melody of the song” (p. 422). They found that words and melody are recalled in association with one another, so that retrieving one enables retrieval of the other; however, the two are not integrated to the extent that a failure to recall one accurately invariably results in the failure to recall the other.

Samson and Zatorre (1991) studied the neurological link between the encoding of text and the encoding of melody in the brain. Participants in their study had lesions in either the right or left temporal lobe of the
brain. The study showed that the left and right lobes play a different role in text and melody recognition: the left lobe is associated with text recognition, but both the left and right temporal lobes are involved in the recognition of melodies. Because of these dual memory codes, Samson and Zatorre uphold that text can cue the melody and melody can cue the text, thus improving recall.

Palmer (2006) revealed that when musicians (pianists) are learning a new piece of music for future performance, the memorization process is enhanced if the musician is able to listen to the music while simultaneously studying the notes, sheet music, and other components of the piece. Palmer offered a simple explanation: memory improves when multiple sources of sensory information are introduced and processed at the same time (e.g., the sounds of the music, the motor movements of the hands over the piano keys, and the visual stimuli of the sheet music). Additionally, Palmer believed that people are more likely to remember meaningful things, and concluded that learning music is actually very similar to the memory processes that individuals use on a daily basis.

Kauffman (1986) also correlated retention curves for musical and nonmusical stimuli, specifically musical memory and verbal/visual memory. He posited that humans are
capable of remembering complete musical excerpts by age seven, encoding the various parts of music such as melody, harmony, and rhythm. Kauffman and Carlsen (1989) showed that the brain structure employed in memorizing music is present in all people, not only musicians.

A great deal of research has studied how humans remember music (see for example, Hebert & Peretez, 1997; Russell, 1987; Delis, Fleer, & Kerr 1978; Dowling & Bartlett, 1981). Remembering music appears to be complicated and may include the quality of the music as familiar or unfamiliar. Delis, Fleer, and Kerr (1978) discovered that participants remember music more effectively if the music is connected to meaningful associations.

As an example of music learning research, Davidson and Colley (1987) investigated the process of memorization of music in professional musicians. The results were not unified. Some musicians relied on aural images or inner hearing of the piece; some acknowledged that they needed to visualize the printed score, while others believed the kinesthetic memory (finger movement) was the crucial component in the process of memorization. Of course, there were musicians who believed that the combination of these modalities or domains was the most efficient way of
memorizing the music. In fact, research reveals that memory for music engages one or more of three modalities: visual, auditory, and kinesthetic (Dalcroze, 1976; Palmer, 2006; Persellin, 1992; Sloboda, 1978; Upitis, 1987). For example, Sloboda (2005) stated that musical memory is an abstraction from physical stimulus (which is a combination of sound, melody, pitch, and text).

This mix of visual, auditory, and kinesthethic features to create a whole music experience can be seen in many different research studies. The recent research done by Lahav, Saltzman, and Schlaug (2007) supported the notion of a “hearing-doing” system as being highly dependent on the individual’s motor repertoire. Using functional magnetic resonance imaging and trained non-musicians to play a song by ear, researchers monitored the brain activity of participants who were listening to a newly acquired music piece. Although the participants did not perform any movements, their frontoparietal motor-related network (consistent with neural circuits that have been associated with action observations) was activated. This condition suggests the brain reacts similarly when performing or observing an action. This type of brain research is especially relevant to the field of education and more specifically to early childhood education that is designed
for children who are learning concepts for the first time. Understanding how the brain works and how memory impacts learning can add a useful dimension to music education and curriculum development.

Musical Development in Early Childhood

Musical ability and musical development have been the objects of study for many years. Increased focus on early childhood education has positively influenced research interest in early music education. Radocy and Boyle (2003) suggested a close relationship between musical ability and intelligence. It seems logical that intelligence can influence musical ability and vice versa.

Some level of intelligence is required for the effective processing of multiple forms of sensory stimuli at once. Music mastery requires intelligence associated with memorization, timing and pacing, the integration of song components, physical skill in actually playing music, and so on. Obviously, musical ability requires an interaction of multiple intelligences and appropriate environmental stimulation. However, in the traditional sense of academic intelligence, musical ability has not been considered essential for success or survival, and it is often not valued as critical for the development of a variety of learning skills.
Musical skill and intelligence have been linked in different instances. For example, Sergent and Thatcher (1974) concluded that highly musical people often are highly intelligent; despite this conclusion, the reverse is less typical – highly intelligent people are not necessarily highly musical. But the question remains – what is intelligence and how do researchers define it?

Gardner (1993) was the first educational theorist to identify multiple intelligences, strategically counteracting the notion that humans have one general intelligence factor. He claimed that musical intelligence was comparable in value to multiple other intelligences, including logical-mathematical, linguistic, spatial, bodily-kinesthetic, interpersonal, and intrapersonal intelligences. Gardner believed that some children have an exceptional ability to imagine music and to “think musically” at a very young age. This appreciation for a variety of different intelligences and capabilities led Gardner to develop his ideas into a refined theory of multiple intelligences. This theory is especially attractive to music educators who recognize the vastness of individual abilities, as well as the impact that music has on other areas of development, and therefore, other intelligences.
Recognizing the value of different kinds of intelligence, Peery and Peery (1987) emphasized that children should be exposed to music for its own sake, because music can enhance cognitive, physical, and social development. Scientific evidence about brain development and the importance of early learning led to conclusion that music education is extremely important in these early years. Specifically, research has shown that infants are able to discriminate among various pitches, melodies, and voices, and even show a preference for particular sounds. Kodály emphasized that a child’s early education should begin nine months before the birth (Choksy, et. al., 2001).

Due to claims of early learning responses, many researchers have studied different variables with infants and young children. For example, research by Papousek (1996) demonstrated that musical responses occur even before birth. One of the earliest responses to the world is a baby’s reaction to sound. The recent research has shown that an unborn child can differentiate between male and female voices and prefers female voices to male voices (Standley, 1998). Fridman (1973) found that at four weeks of age a baby is able to differentiate between different voice colors. A similar finding is offered by Michel
(1973), who stated that a two-month-old infant can differentiate between two different tone colors.

Beyond an understanding of unborn child and infant responses, other researchers have chosen to target a slightly older demographic of preschool aged children, who are learning about music in a more structured environment. In order to better explain preschool musical development, a number of researchers tried to categorize different components of the music learning process, such as vocal range, rhythmic development, pitch development, song development, and tonal maturation (Alvarez, 1981), and the development of vocal, melodic, rhythmic, physical, and conceptual responses (Miller, 1983).

Although there are a great variety of categories that might be investigated, scholars such as Feierabend (1996), as well as Seefeldt and Barbour (1994) agreed that the three most basic aspects of music knowledge include singing, rhythmic development, and listening development. However, scholars contend that the learning process also includes memorization. Therefore, the development of musical knowledge, including singing, rhythm, listening, and memorization processes will be discussed in more detail in the following sections.
Singing Development

Singing has been recognized as a child’s natural way of responding to environmental stimuli. Seefeldt and Barbour (1994) believed that singing precedes speech as a normal part of children’s growth and development. Research shows a significant relationship between the frequency and type of crying behavior and children’s later musicality and ability to speak. “The first cry of the newborn is the generator, not only of the spoken language and of musicality, but also of movement and musical rhythm” (Fridman, 1973, p. 264). For a baby who has little knowledge of the body that belongs to him or where it begins and ends, and for the newborn who has clearly not yet mastered bodily movement, the act of crying can be viewed as the baby’s most basic, logical, and natural expression of movement.

Many scholars and researchers suggested that children’s melodic responses should be stimulated by vocal responses. Fridman (1973) concluded that a mother should sing to a baby and echo the baby’s sounds from birth to build the bond between the two. Moog (1976) showed that babies make a different kind of babbling sound than they usually do after exposure to musical sounds. He made the
distinction between “musical” babbling and spontaneous babbling, which is a precursor of speech.

When babbling turns into language, children exhibit interesting responses to music. Specifically, preschool-aged children usually show their recognition of familiar songs by joining in and singing along. At the age of four and five years, they are able to discriminate between aspects of pitch and melody, such as high and low, upward and downward. Furthermore, they begin to discover the difference between their singing and speaking voices and are able to accurately sing familiar songs and stay within a key. According to Campbell and Kassner (2002), children progress through five stages as they learn new songs: (1) reproduction of lyrics, (2) rhythm of the words, (3) contour or shape of the melody, (4) individual pitches within the melody, and (5) the tonality.

Additionally, children’s ability to match pitches and sing in tune, as well as their vocal ranges, increase with maturation and training. Alvarez (1981) analyzed the available research about the vocal ranges of three- and four-year-olds and concluded that the ranges were difficult to define because the various researchers used different methods. Alvarez also summarized the current findings and concluded that children preferred smaller intervals over
larger intervals. Also, smaller intervals and descending intervals were learned more readily.

In recent studies, the ranges of children’s vocalizations seemed to be wider than previously reported. The vocal abilities of four- and five-year-old children may span across a range of nearly two octaves, and they are most likely to sing in tune within a range of five pitches, from d to a (Campbell and Kassner, 2002). Because of developing vocal ability, children in the primary grades are more apt to sing in tune than younger children. A typical vocal range for six-year-olds is from C to b, and by second grade, children are able to sing in tune from C to d. Additionally, children tend to reveal wider ranges and sing higher in relaxed and spontaneous situations than in testing situations (Jinyoung, 2000).

With respect to general singing ability, Kirkpatrick (1962) reported large individual differences among preschool children. Generally, it has been shown that the development of vocal ability is dependent upon maturation (Boardman, 1964; Zimmerman, 1971; Campbell & Kassner, 2002) and training (Boardman, 1964; Jinyoung, 2000). Although children may recognize lyrics and can sing along with music, studies have also found that children have unique and natural responses to rhythm that have been studied.
Rhythmic Development

Children naturally move to music while singing. A child might sway, tap, shake, snap, clap, and/or move in a variety of other ways with the entire body or just parts of the body. Regardless of whether or not the child is conscious of the physical movements, the movements do occur in response to song or music. A child’s rhythmic bodily response is a natural reaction to sound – this notion has been validated and supported by previous research. The following section will discuss rhythmic development in young children. Rhythm is considered one of the most important aspects in early childhood music. Rhythmic perception develops early and children’s abilities to perform pulse and to reproduce patterns emerge even before they begin formal schooling.

Several researchers have studied aspects of rhythm among young children. Specifically, research by Fifield (1980) showed that rhythmic perception is more advanced than melodic perception among three-, four-, and five-year-old children. Additionally, Rainbow (1977) conducted a longitudinal study to assess the ability of three- through five-year-olds to learn specific rhythmic tasks. He found that the easiest task was to first coordinate movement with speech rhythms, then to keep a steady beat on simple
instruments, and finally, to control large motor movements to the beat, as in marching. Four-year-olds were more successful than three-year-olds in performing all rhythmic tasks. Between the ages of four and six, and as a result of improved physical coordination, children’s ability to keep time increases. Gardner (1971) also reported that children’s age affects their accuracy in reproducing rhythmic patterns.

A different study of free play activities with musical toys (Flohr, 1984) showed that improvisations of three-year-old children were rhythmical, basically consisting of patterns of equal note values. Four-year-old children included repetition and similar phrases, while rhythmical responses of five-year-olds were more advanced and showed an increase of rhythmic repetition. As Alvarez (1981) concluded, “the linear increases reported in all studies support a theory of steady-beat maturation” (p. 190).

Additional studies support the notion that a child’s ability to keep the beat increases with age and maturation. For example, Alvarez (1981) and Fifield (1980) found that general rhythmic development, as well as rhythmic performance ability, is dependent upon maturation and experience. Alvarez also concluded that there is a linear development in the growth of rhythmic ability, and that
rapid rhythmic growth occurs in children between the ages of three and four. Four-year-olds can play rhythm instruments, echo rhythmic patterns, and move to music with more expression than many three-year-olds. Four-year-olds can also make sustained smooth movements to music and can adapt their body movements to contrasting and changing accompaniments (Seefeldt & Barbour, 1994).

Beyond a natural connection to the rhythm of music, there are additional factors that impact learning and musical development. Children can hear music, but listening to music involves a more careful focus on the musical components. The following section will outline several of the specific aspects of music listening, and how these factors might impact learning and retention of music content.

Listening Development

Although listening is basic to all music activities, the ability to listen is more than just hearing. Listening to music is an active process of perceiving, understanding, and responding to music. According to Feieraband (1996), listening is one of three basic musical behaviors that “must be nurtured during the earliest months of life” (p. 19).
In order for children to be able to perceive, understand and/or perform music, they need to become capable of recognizing and understanding many musical elements such as melody, rhythm, form, texture, dynamics, and timbre. They have to become active listeners who are listening with the main purpose of enjoying the components of a particular piece of music. Birkenshaw (1982) outlined three auditory component skills. The first, auditory awareness is concerned with the simple recognition of the presence of sound. The second, auditory discrimination requires the ability to distinguish between sounds and to group them into categories such as fast-slow, loud-soft, high-low, etc. The third skill, auditory sequencing, deals with the ability to reproduce a sequence of sounds in the correct order and therefore requires the exercise of auditory memory as well (1982, p. 33).

Development of an aptitude for music develops in a sequence. Studies by Greenberg (1976), Moog (1976), and Zimmerman (1971) showed that some musical elements such as pitch, rhythm, and melody, may be understood earlier than others. For instance, Greenberg (1976) found that the concepts of beat, tempo, and dynamics are the first to develop in young children. Young children are also very attentive to timbre (Fridman, 1973). Concepts like melody
and melodic rhythm develop later, while harmony and form seem to be the most difficult concepts for young children to understand and develop. Loucks (1974) stated that three- and four-year-olds could successfully distinguish between traditional orchestral instruments and could identify categories of instruments by sound. The main idea in the development of listening skills is the ability to perceive sounds and to create meaningful mental representations about those sounds, in other words, to learn to understand music.

Between the ages of three-and-a-half and four years, children become increasingly aware of some of the concepts of music, and it is during this period that the first dramatizations of songs occur. As a result of a longer attention span, four-year-olds are able to listen to music more attentively and can respond to it with more accuracy and expression (Miller, 1983). In her study, Miller observed children in a natural setting and reported that four- and five-year-olds stood close to the record player and listened without playing instruments, although no three-year-olds demonstrated listening in this manner. They also extended their understanding of pitch (high-low) as well as other expressive aspects of music. Participants attempted to imitate the rhythm of the recorded music, and
demonstrated spontaneity and creativity in response to what they were hearing. It was noted that the five-year-old females in the study even added spontaneous singing to their physical movements.

Miller (1983) concluded that young children were capable of making music freely and spontaneously in a natural setting. Research observations showed that participants responded to sounds in a variety of different ways. Participants examined and manipulated instruments; listened attentively to sounds; played instruments; sang, chanted or moved body parts to accompany the recorded music; imitated spontaneous rhythms and movements of peers; responded physically to the basic beat of the recorded music; and experimented with sound combinations through noise-making strategies of their own.

In addition to knowledge about children’s musical development, it would be helpful for music educators to explore student responses to movement-based instruction. Equally important is the understanding of the possible impact of movement on specific music learning concepts, and general learning (i.e., literacy). The following section will outline some of the areas of interest with regard to music education and the use of movement.
The Relationship Between Movement and Music Development

In order to create effective and meaningful teaching and learning experiences for young children, their perceptions of reality and their responses to movement and music must be taken into account. Several studies have examined children’s movement responses in both experimental and naturalistic settings.

Children’s Movement Responses

Ferguson (2004) sought to analyze teachers’ understanding of children's expressive movements to music in the classroom. This study analyzed children’s expressive movements in response to music in the context of fourth- and fifth-grade music classrooms. The purpose was to establish the degree to which students' expressive movements match their verbal understandings of music, and the degree to which peer interaction shaped students' understandings of music.

Data were collected over a period of five months by videotaping music classes, videotaping student interviews, and audio-taping teacher interviews. Findings showed a variety of interdependencies between social context and movement to music; some students' movements were highly stable across different social situations, while those of other students were highly unstable. Stability of context
seemed to be more dependent upon developmental understanding of social interactions than personal musicianship. Expert peers in classroom movement tended to be strong social leaders. Despite the level of musicianship demonstrated in the movements, students with a high need for peer interaction tended to have less stability in their movements between contexts.

Metz (1986) observed two-, three-, and four-year-old children’s movement responses to music in a researcher-designed music center. Children were placed in three separate classrooms. Videotapes of sessions were used to analyze the data through the constant comparative method. Three theoretical core categories emerging from data analysis were conditions, interactions, and outcomes. The primary result of the study was the generation of a substantive theory of children’s movement responses to music.

The researchers found that during a period known as free exploration (i.e., when children were left to respond to various musical excerpts without any guidance from the researcher), children moved naturally to the elements of sound/silence, overall musical style, and fast/slow. It appeared that children could not differentiate between loud and fast music or quiet and slow music. In the phase of
guided exploration, the researcher interacted with children in order to determine the possible effect of the teacher. Metz found that by encouraging movement responses that are naturally exhibited by children, the teacher could enhance their responses to music. The researcher concluded that the functioning of movement provided an essential link between hearing music and perceiving music, and that “movement is a key to increasing musical perception at all levels of instruction” (p. 118).

In a study conducted by Morris (1992), preschool children’s sensitivity to changes in music through movement was examined. Three- and four-year-old children were asked to represent, through movement, their sensitivity to changes in dynamics, timbre, tempi, pitch (register), texture, and articulation. The observation took place during regular classes where all groups had the opportunity to react to changes in musical examples through body movement and when using a prop. Half of the students responded first through body movement, while the other half responded first using a prop. In-depth observations revealed accurate responses to changes in tempi and articulation, and least accurate responses to changes in timbre.

In order to generate information regarding three-, four-, and five-year-old children’s creative movements,
Sims (1985) conducted a study in which each subject responded to a minimally structured, movement-to-music task. The stimulus music was a combination of excerpts from three different pieces of music, contrasting in tempo, style, and medium. Each subject’s performance was video-recorded for subsequent analysis. A Movement Observation Form (MOF) was devised to record categories of movement, used in cooperation with a Rhythmic Movement Observation Form (RMOF).

The results showed that children’s creative movements seemed to be spread over four movement categories. However, a large contrast was found in the use of locomotor movements by five-year-olds, who use movements almost twice as often as the three-year-olds. Five-year-olds also responded to the beat almost three times more often than the three- and four-year-olds. Although the children were not asked to respond to changes in music, they spontaneously reacted to it, indicating a readiness for more structured listening and movement activities. In addition, it was observed that most participants tended to use a limited movement pattern. The author speculated that this could be due either to limited creative movement repertoire or to children’s fascination with movement repetition.
Carlson (1983) examined the effects of movements in music classes on student attitudes. The control (non-movement) and the experimental (movement) groups were chosen randomly from a population of fifth-grade students. Both groups received two 30-minute lessons over an eight-week period. At the conclusion of the eight weeks a post-test was administered to every student. Each student's score was the result of the average of the score given by the two raters. Factor analysis was used to analyze the data.

Results from the analysis indicated that students responded more favorably to music programs when teachers used movement activities as part of the learning process. In addition, Carlson observed that movements that were custom-made for particular interactions with pieces of music, such as choreographed movements, were more meaningful to students than generic movements that could be done to any piece of music (e.g., rhythmic tapping or clapping). Thus, he stressed the importance of teachers' understanding of movement theories and how they could be implemented into classroom practice.

Several studies explored the effect of movement-based instruction on one or more aspects of melodic perception, as well as its impact on melodic learning. Melodic
perception is the individual child’s initial schemata about a song’s melody that has been constructed by exposure to a variety of other song components. An individual melodic perception can influence the learning and retention of actual melodic content.

The Influence of Movement Activities on Melodic Concepts in Children

Crumpler (1983) investigated the effect of Dalcroze Eurhythmics on the melodic musical growth of first-grade students and the possible differences between boys and girls in their ability to discriminate pitch register and melodic contour. Students in the control group were presented the melodic units of the 1978 Silver Burdett Music, while the students in the experimental group used Silver Burdett Music and Dalcroze Eurhythmic activities. Results indicated that eurhythmics activities had a positive influence on the melodic-discrimination abilities of first-grade students. The author suggested the inclusion of movement techniques when presenting melodic concepts to children.

Reeves (1997) tried to determine if the combined use of locomotor movements and a singing activity in the kindergarten music classroom would influence melodic pitch discrimination and picture-word recognition (based on the
results of two tests). After a six-week music instructional period, data were collected using the Simons Measurements of Music Listening Skills (SMMLS), which is a standardized music test (K-3), and Smith's Picture-Word Recognition Test (PWRT), which is an unpublished teacher-made test.

Results from a t-test analysis for independent samples showed that kindergarten students had different testing responses after learning action songs through music instruction that included movement. Participants who received instruction with movement scored significantly higher on the SMMLS than participants whose instruction did not include movement. The use of movement in music instruction did show a positive impact on pitch discrimination, as evidenced by the test results.

The purpose of Cheek’s (1979) study was twofold: to examine the effects of creative movement and rhythmic training on children’s discrimination of pitch, intervals, meter, and music reading skills, and to find out the possible influences of these psychomotor experiences on the students’ self-concept. Two intact fourth-grade classes were taught a series of lessons by the researcher. In addition, the experimental group received rhythmic training in the form of creative movements, body rhythm, and hand gestures. The results revealed that physical activities
significantly affected students’ achievement in music reading skills, meter discrimination, rhythm response, and self-concept.

Lewis (1986) observed the effectiveness of movement-based instruction on the improvement of elementary students’ aural perception. She also looked for a likely interaction between students’ attitudes toward movement-based instruction and their responses to the instructional method as measured by achievement on aural perception tests. The various properties of aural perception included melodic direction, meter, rhythm patterns, dynamics, and tempo. Both experimental and control groups received 12 lessons designed by the investigator. The experimental group received movement-based instruction as well.

Results from this study indicated that students who received movement-based instruction scored significantly higher on the selected aural properties such as melodic direction and dynamics. Also, a significant positive correlation was found between students’ attitudes toward movement-based instruction and their ability to perceive meter.
The Influence of Movement Activities on Rhythmic Concepts in Children

Much of the literature examining movement in the music classroom has been conducted primarily to determine the influence of movement on different rhythmic concepts. One of the reasons and possible explanations for frequent use of movement in the development of rhythmic skills may be found in the “motor theory” of rhythmic response (Lundin, 1967).

Blesedell (1991) studied the influence of two types of movement instruction upon rhythm achievement and the developmental rhythm aptitude of preschool children. She compared the effects of Dalcroze-based movement instruction and Laban-based movement instruction on rhythm achievement and rhythm aptitude. Participants were 51 three- and four-year-old children from intact classes. Each class received ten 30-minute Dalcroze- or Laban-based movement lessons. Gordon's Audie was administered as a pre- and post-test to determine a developmental rhythm aptitude of each child. Each child was individually videotaped while performing micro- and macro-beats on a small hand drum along with a song. A significant difference between the pre-instructional and post-instructional Audie scores was
found, indicating that instruction increased developmental aptitude regardless of the movement type.

The main idea of Joseph’s (1982) study was to examine the use of Dalcroze Eurhythmics in a kindergarten class. Three groups of kindergarten children were included in this study. Over the period of one school year, one group received an "informal" music program, while the second group received Dalcroze Eurhythmics with improvisation, and the third group received Dalcroze Eurhythmics without improvisation. Post-test results revealed that children receiving Dalcroze Eurhythmics training outperformed children not receiving this training in their recognition and response to familiar rhythm patterns in unfamiliar music. It was also found that children receiving eurhythmics training outperformed children not receiving this training in improvisational tasks.

Rose (1995) investigated the effects of Dalcroze Eurhythmics instruction on beat competency performance skills of kindergarten through second-grade children. A group pretest, which measured individual beat competency performance skills, was administered to each class. Results revealed a significant effect of instruction, gender, and grade level on the pretest. The Rhythmic Movement Analysis Test (RMAT) was designed to measure beat competency
performance using five different rhythmic activities at four different tempi. Post-test data showed that the Dalcroze instruction group scored significantly higher than the traditional instruction group, indicating the positive effect of movement-based instruction.

Another study that examined the relationship between movement and synchronization ability of students was one conducted by Rohwer (1998). Additionally, an effect of movement instruction on beginning instrumentalists’ steady beat perception and performance was explored. Seventy students were randomly assigned to either the treatment or control group. The treatment group received movement instruction created from general music, dance, and theoretical ideas, while the control group received traditional rhythm instruction. Three dependent variables (perception, synchronization, and performance) were measured to assess the impact of movement instruction on three aspects of rhythmic ability, steady beat perception, synchronization, and performance. After ten weeks of instruction, the students’ ability to move rhythmically was improved in the treatment group. In addition, their ability to accommodate synchronization of movements in many tempi was greater than those in the control group.
Similar findings were obtained by Croom (1998). The purpose of this research was to gain information about the effects of rhythmic locomotor experiences on the synchronization ability of five- and six-year-old students. The Primary Measures of Kinesthetic Responses to Tempo in Music (PMKRTM) was used as a pretest and post-test assessment tool. Instructional content was identical for both the experimental group and the control group, except that each group received a different proportion of locomotor and non-locomotor rhythm instruction. The experimental group received approximately 90% of its rhythm lessons using locomotor movements, and the control group received approximately 90% of its rhythm lessons using non-locomotor movements (sitting and moving only the arms, legs, head, and torso).

Participants engaged in activities where they danced, sang, clapped, chanted, played rhythmic games, and used rhythm instruments. Content for the lessons consisted of age-appropriate songs, rhythmic games, chants, and movement activities. Three judges independently rated each child's videotaped pre- and post-instructional PMKRTM performance. Results revealed that the participants who experienced locomotor movements showed greater, yet not statistically
significant, improvement on synchronization tasks than the participants in the control group.

In an attempt to investigate the nature and characteristics of rhythm aptitude and its role in developmental music aptitude, Moore (1984) conducted an experiment among primary-age students. An experimental group received special instruction in rhythm and movement, while the control group was administered traditional music instruction for the same period of time. A music aptitude test was administered to the experimental and control groups as pre- and post- tests to examine and compare possible changes in rhythm aptitude and music aptitude. Results indicated that the experimental treatment had a significant effect upon rhythm aptitude.

As Ferguson (2004) pointed out, not all studies resulted in positive effects of movement on music learning. Lewis (1986) and Gates (1993) (as cited in Ferguson, 2004) evaluated studies that measured locomotor movements and music memory, as well as studies of fine-motor movements, and compared those studies with other teaching methods that included verbal and visual activities. The research comparisons resulted in negative or inconclusive findings.

There is a vast body of research about the outcomes of movement-based instruction on the development and learning
process of primary-aged students in the general music classroom. However, movement activities have also been successfully used with older students, but in a different setting. The following section will review the use of movement in choir rehearsal (McCoy, 1989; Wis, 1993).

The Influence of Movement Activities in Choir Rehearsal

Movement has an impact on musical learning; however, kinesthetic reinforcement of concepts also helps build tonal musicianship skills. For example, singers naturally internalize a song’s rhythm with the help of physical sensations; hand signs add another dimension of sensory input which can help singers hear and internalize tonality and pitch. Movement can be used to help teach or reinforce concepts such as musical understanding, vocal technique, musicianship skills, and artistic expression. According to Bailey (2007), “Kinesthetic associations with musical concepts transcend the physical actions of the exercises themselves, and genuinely teach the students about music” (p. 26).

The purpose of the study conducted by McCoy (1989) was to assess, under controlled conditions, the effectiveness of the use of movement in the choral rehearsal. Two high school choral ensembles rehearsed the same compositions under different conditions: instruction for one ensemble
included movement (a vocabulary of gesture and movement developed by the researcher), while the instruction for the other ensemble did not include movement. After a treatment period of nine weeks for the advanced group and eleven weeks for the less-advanced group, three dependent variables were measured, including choral performance, proficiency, and student attitude toward participation in choral ensemble. The Cooksely Choral Performance Rating Scale (CPRS), the Colwell Music Achievement Test, and a researcher-designed Attitude Rating Scale were used as the measuring instruments.

The results showed that movement strategies improved ensemble performance, specifically with the accuracy of tempi, better balance, and blend among parts. A significant difference in attitude toward participation in choral ensembles was noted; particularly, the experimental group evidenced a more positive attitude than the control group.

Wis (1993) investigated how the use of gesture and movement in the choral rehearsal can function as a physical metaphor in order to facilitate learning and to enhance musical experience. The primary aim of this study was to develop a foundation, primarily through the review and synthesis of literature on the body as a metaphor. Documentation and a discussion of movement activities used
in rehearsal by two choral directors provide an empirical realization for the practical application of a movement-based choral pedagogy.

The following conclusions may be drawn from this study: (1) movement activities make use of the choral singer's natural inclination toward bodily-based learning, and allow for the freedom and energy inherent in everyday activities to be metaphorically transferred to the singing process; (2) movement activities may encourage more active participation on the part of the singer, and can provide a visible accountability system for the learning that goes on in the choral rehearsal; (3) movement activities are less subject to misinterpretation than words, and are better able to capture the ineffable qualities of music.

Movement and Communication

As a natural accompaniment to everyday communication, gestures have been studied from different perspectives. The idea that gestures play an active role in thinking has been explored minimally to supplement information, both from psychological and mathematic perspectives (McNeill, 1992; Goldin-Meadow, 2003). Gesturing allows listeners to communicate and allows speakers to think. Sign language is one example of how the body can be used to convey language and meaning, even non-literal meaning. American Sign
Language (ASL) uses the spatial relationships of the hands and body to describe syntactic information, such as verb objects and nouns, by manipulating loci of the hands and body relations. That is, the body is used as a vehicle for thought.

Studies involving the role of gestures support the notion that the body plays a key role in the formation of complex concepts and ideas (Nicoladis, Mayberry, & Genesee, 1999; Leiner, Leiner, & Dow, 1993). Undeniably, it has been suggested that there is no innate difference between thought and movement at the level of the brain: both can be controlled by identical neural systems (Ito, 1993).

Therefore, concepts and ideas can operate together rhythmically, just as body parts do in action. Ito compared the “motor system” with a complex computational network capable of controlling and directing the brain’s circuitry. He believed that gestures which accompany language may actually facilitate thought. For instance, people speaking on the telephone usually gesture, even though this plays no obvious role in communication. In short, individuals can gesture for the self or for others, and gesture is both a means of communication and thinking. Gesture can facilitate the creation of ideas, as supported by the work of Goldin-Meadow, who claimed that, “when we speak, this image is
transformed into a linguistic and gestural form” (Goldin-Meadow, 2003; p. 178). According to Information Packaging Hypothesis (IPH), gestures help speakers organize spatio-motoric information (Alibali, Kita, & Young, 2000). Spatio-motoric thinking is normally employed when people use the body to interact (e.g., interactions with an object, locomotion, or imitating somebody else’s action) with the physical environment.

Learning Modalities

Taylor (1989) observed that music and arts operate in sensory media through different modalities such as sound, vision, touch, and movement. Despite their function (as audience, creators, or performers), human perception of these modalities (or sensory systems) may involve not just one modality but interaction of several modalities. In the music education literature, the multi-sensory nature of human perception was found to be a backbone of a few approaches such as the Sensory-Motor approach to music learning (Carabo-Cone, 1977) and the Seeing, Listening, Thinking, and Moving approach (Steinitz, 1981). Zimmerman (1984) believed that a multi-sensory approach played a very important role in concept formation. She found that with the presence of visual aids, children were able to conceptually organize musical sounds
significantly better than without the visual help. The use of movement with other learning modalities has been also studied by Young (1982), who investigated pre-kindergarten students' understanding of tempo, articulation, and pitch concepts using nonverbal and manipulative techniques. Children in the study were given the Peabody Picture Vocabulary Test, followed by a test of musical concepts. Picture test items included movement, identification of movement in pictures, and sound effects. This assessment was used to introduce terminology and to give the children associations that could be used in the identification of concepts in the musical examples. The concepts tested were fast and slow, legato and staccato, and high and low; testing also included the concepts of faster and slower and higher and lower. The results indicated that students understood musical concepts better when visuals and movements were used for instruction, rather than verbal instruction only.

In a more recent study, Persellin (1992) attempted to answer the question of whether the combining of two or more learning modalities during the teaching process would confuse children. Participants were first-, third-, and fifth-graders. Six rhythmic patterns were presented to children through one of the three modalities (visual,
auditory, kinesthetic) or through a combination of the modalities. After instruction, children’s recall of rhythmic patterns was tested. All children were presented with the same six rhythm patterns in the same order, but the type of modality was determined randomly. Results indicated that students were not confused by the multi-modality presentation.

Legette and Hair (2002) explored the influence of various stimulus conditions (i.e., audio, visual, and audio-visual) from children’s educational television programs on the attention and preferences of kindergarten students. Children were presented with several different television excerpts, including one containing aural and visual stimuli together, and others with aural or visual stimuli, but not both. Observers recorded the length of time children attended to each excerpt and used a short questionnaire to gather information about subject preferences and features that had the strongest impact on attentiveness.

The results of the study indicated that, in terms of visual stimuli alone, children attended to characters for the longest period of time; however, when aural and visual stimuli were presented together, children focused their attention on the specific feature of movement. Essentially,
children were drawn to singing that was paired with movement. Results suggest that children show strong preference toward excerpts in the audio-visual condition. Alongside the audio-visual condition, this study sought to determine the concrete features that children attend to during the exposure to television excerpts. In this study it was found that children attended to movement the most, followed by singing.

Similarly, Gromko (2005) conducted a study with kindergarten students in order to determine whether music instruction was related to the development of young children’s phonemic awareness. Kindergarten children who received 4 months of music instruction, combined with kinesthetic movements, scored significantly better in their abilities to discriminate individual sounds or phonemes of a spoken word (phoneme segmentation tasks) when compared with children who did not receive music instruction. Gromko concluded that active music making and the association of sound with appropriate symbols may develop cognitive processes similar to those needed for segmentation of a spoken word into its phonemes.

It has been shown that perception does not operate solely through single modality, but rather as a blend of several different modalities (Taylor, 2000). Accordingly,
when presenting new material to children, combining different modalities was more helpful than confusing. In addition, the movement seemed to elicit positive reactions and responses among students. Therefore, the following section will provide a review of the studies that examine the influence of movement on music learning in different settings.

The Use of Movement as Effective Teaching Practice

Because related research can be invaluable, music educators should be encouraged to use information regarding children’s normal development in conjunction with knowledge about the impact of movement-based instruction on their music development. In addition, observations and conclusions regarding student’s musical responses, their interests, and their attitudes toward movement-based instruction could additionally contribute to this endeavor.

Several studies have attempted to find factors that could be used to create “effective teaching practice.” In 1983, Carlson sought to determine if movement, when used as an integral part of music instruction, significantly affected fifth graders’ attitudes toward music class. Over a period of eight weeks, both experimental and control groups received two 30-minute lessons per week. The same teacher taught the four classes with the same content, but
with different methodology. At the conclusion of the eight weeks, a post test was administered to every student. Each student's score was an average of the scores given by the two raters. Factor analysis was used to analyze the data. Results indicated that fifth graders responded more favorably to their music programs when allowed to participate in movement activities as part of the learning process. Males tended to respond more favorably than females within the movement groups.

Connors (1995) attempted to describe the use of movement in general music classrooms in elementary schools in Los Angeles. He surveyed elementary general music teachers regarding their training in, attitudes toward, and the use of movement in the music classroom. He also included in-depth interviews and observations of selected teachers in the data collecting process. Results showed a positive relationship between college coursework that involved music with movement instruction and the use of movement-based instruction by these teachers in their future classrooms. Teachers who were taught music education classes with movement as an instructional approach were more likely to use the approach in an actual teaching setting. Additionally, teacher educational background influenced the perception of the role of movement in
instruction. In general, teachers expressed positive attitudes toward the use of movement. Finally, rhythmic/movement activities were emphasized more in the lower elementary grades than in the higher grades.

In a more recent study, Tselentis (2000) observed teaching practices in a preschool music and movement program. Tselentis examined the behavior and actions of one music and movement teacher, coupled with a look at one student's participation and reactions. The researcher sought to answer the following questions: 1) What kinds of music and movement activities create opportunities for social, motor, cognitive, and language development? 2) In what ways would a child having difficulty in the classroom respond to the teacher and activities in a music and movement enrichment program? 3) What kinds of teachers' qualities have a positive impact on a child's behavior and development? The results of this study showed that the music and movement activities promoted positive experiences for the subject. It also found that the skillfulness of the teacher was a critical factor in the success of the music and movement program.

A review of the literature shows that many researchers have investigated the effectiveness of movement-based instruction on learning and development in music. The
majority of these studies confirmed that movement is a beneficial component in the process of understanding musical concepts, and therefore, movement instruction can enhance musical development.

Based on a review of the existing literature, educational and psychological researchers have confirmed and reconfirmed that there is a triadic relationship between physical movement, the human memory, and the song-learning process. As a result, the topic of movement-based music instruction deserves a more in-depth investigation with a specific focus on its impact on memory. The current study has been designed to gather more information about this specific movement-memory-learning relationship.
CHAPTER III

METHODOLOGY

The purpose of this study was twofold: (1) to investigate the effect of movement instruction on memorization and retention of new song-material in first-grade students and (2) to explore the possible differences between the types of movement (nonlocomotor and locomotor) used in the process of instruction upon memorization and retention of new song-material. Thus, the present study was conducted in two separate but very similar experiments (Experiment 1 and Experiment 2).

Based on the designs used in previous research, a counterbalanced design was used to explore how children respond to music in this study. There have been a number of different methodologies used in previous research; however, the method that was most effective in studying the factors of interest in the current research was the counterbalanced design.

In a counterbalanced design, order effects can be evenly distributed across two conditions. There were two conditions in this research - instruction with movement and
instruction without movement. Moreover, because there were repeated measures with the same population of participants, the counterbalanced design was used as a method for controlling order effects (Green & Salkind, 2008).

After completing a thorough review of the current research and how previous researchers have designed their studies to analyze music education data, I chose a counterbalanced design that was similar to the research done by Klinger, Campbell, and Goolsby (1998). In this study, researchers examined the effect of two instructional procedures for teaching songs to children: (a) immersion and (b) phrase-by-phrase. Within two classes, each child was taught, and then was asked to perform two children’s songs (A and B). The treatment was counterbalanced so that Group 1 learned the first song through immersion and the second song phrase-by-phrase, while Group 2 learned the first song phrase-by-phrase and the second song through immersion. The current study was set up in nearly the same way, to ensure that order effects did not impact study outcomes.

Using the counterbalanced design allowed this researcher to compare the average scores for all groups on the post test for each treatment, identified as the instruction type with movement or without movement. In
other words, the averaged post-test score for all groups during the first treatment can be compared with the averaged post-test score for all groups for treatment in the second treatment and so on, for an unlimited amount of times in the study (Fraenkel & Wallen, 1996). Additionally, the counterbalanced methodology will provide unbiased estimates of the effects of interest (Pollatsek & Well, 1995). The following chapter will provide further details about the organization of the current study, the methods chosen for the research, and other factors relating to research design.

Experiment 1 was designed to assess whether or not movement instruction had an impact on student memorization and retention of song material. Participants in Experiment 1 were tested with both movement and non-movement instruction across two test periods, and results were analyzed across four distinct musical variables: text, pitch, melodic contour, and rhythm.

Experiment 2 was designed to follow the same procedures and methods used in Experiment 1, with the same participants and with musically similar songs, but with a different (more specific) research intention. Experiment 2 was conducted to help determine which specific type of movement was most effective in song memorization and
retention – locomotor or nonlocomotor movement. Like Experiment 1, Experiment 2 included two test periods and an analysis of the same variables: text, pitch, melodic contour, and rhythm. Experiment 1 and Experiment 2 were conducted with the same methods, procedures, and participants, and with similar songs. The experiments differed with regard to the type of instruction that was administered: movement or non-movement (Experiment 1), and locomotor or nonlocomotor movements (Experiment 2).

Participants

Participants for this study consisted of first-grade students (N = 83 for Experiment 1) and (N = 92 for Experiment 2) selected from a suburban public school in Northeast Ohio. Permission to conduct the study was obtained from the Kent State University Human Subjects Institutional Review Board (see Appendix A). Initial consent was also obtained from the building (school) principal and from the classroom music teacher (see Appendix B). Parental consent forms were delivered to homeroom teachers and were sent home with all children in the intact classrooms that were selected for the research (see Appendix C).

Upon approval and consent from these parties, participants in four intact classrooms were identified for
both Experiment 1 and Experiment 2. Participants in the four classrooms were randomly assigned to the treatment groups, so that two of the classes were randomly combined as Group I, and the remaining two classes were combined and identified as Group II. The same participants were used for both experiments; however, as stated, there were 83 participants in Experiment 1 and there were 92 participants in Experiment 2. The small difference in sample size between the two experiments was a result of student absences from Experiment 1. However, only data from the participants who completed both testing sessions for both experiments were included in the statistical analysis.

Materials

Songs selected for the research procedure included a total of four traditional children’s songs. Two songs were used in Experiment 1: “Clap Your Hands Together,” labeled as song A and “All Around the Buttercup,” labeled as Song B (see Appendix D). Similarly, two songs were used in Experiment 2: “Dappled Pony,” labeled as Song C and “Grizzly Bear,” labeled as Song D (see Appendix E). In both experiments for this research, the music teacher introduced and taught the songs to the participants using the whole-song approach (see Figure 1).
The whole-song approach

1. Teacher sings the entire song to class.
2. Teacher asks the first text-related question to direct the children’s attention to the song (in preparation for Step 3).
3. Teacher sings the entire song to class again.
4. Teacher asks the second text-related question to direct the children’s attention to the song (in preparation for Step 5).
5. Teacher sings the entire song to class again.
6. Teacher sings the entire song again, asking children to “join in” when they can.
7. Children sing entire song with the teacher.
8. Children sing entire song without the teacher.
   Each of three smaller groups separately sings the entire song.
9. All children sing entire song without the teacher.

Figure 1. Teaching process through the whole-song approach (adapted from Klinger, Campbell, and Goolsby, 1998).

The songs were primarily selected because of their similar musical structures. The intent was to reduce song differences as much as possible to help control for the music used in the research and controlling musical material would allow other variables of interest to become the predominant foci of the study. The only real way to control for song variation would be to use the same songs. The intended purpose of the study is altered if song material is the same. The musical capabilities of first-grade students also were noted, and used as an additional criterion for song selection.

Written in the key of D and key of F (with a range c – a), all songs consisted of major seconds, minor thirds, and
perfect fourths. Campbell & Kassner (2002) reported that six- and seven-year-olds sing in tune in a range of d – b. Moreover, Choksy (1999) found that the universal musical vocabulary for young children included intervals of seconds, minor thirds, and perfect fourths. Therefore, songs chosen for this study are within the guidelines of established research on children’s vocal development.

For the purpose of consistency, each song was identical in length (eight measures) and contained the same number of phrases (four). Rhythmically, songs were comprised mostly of quarter and eighth notes in 2/4 meter (stepping songs).

Although the spontaneous singing of English-speaking children alternates between 2/4 and 6/8 meters, the decision to use songs in 2/4 was based on the motor abilities of six-year-olds (Choksy, 1999). The decision to use 2/4 meter rather than 6/8 was due to the fact that children have performed duple meter (2/4) since they first learned to walk and the pattern is, therefore, developmentally sound. Final decisions regarding the song selection were made after a single, informal interview with the music teacher to ensure that students were not already familiar with the selected song material.
Design and Procedures

Preparation for the music instruction treatment involved several meetings between the researcher and classroom music teacher. Several weeks before the experiment, consecutive meetings were held to discuss research procedures and introduce the teacher to all songs that were chosen for this study. The decision that the music teachers administer the treatment was made because of her familiarity with the students and vice-versa. The researcher evaluated the students after treatment, recording and assessing student learning and retention in Test 1 and Test 2 for Experiment 1 and in Test 3 and Test 4 for Experiment 2.

After engaging in pre-treatment preparation with the music teacher, the researcher also participated in a pre-treatment orientation with the four intact music classes during regularly scheduled music lessons with their music teacher. Students were introduced to the researcher, there was a class review of the research procedures, and both the teacher and the researcher engaged in singing with the children.

This orientation allowed children to comfortably display their musical skills for the researcher in a natural setting as children were asked to sing familiar
songs in the intact classroom. These songs were not used in the experiment. Additionally, the pre-treatment phase allowed the researcher to better understand the skill and ability levels of the participants. During orientation, the teacher modeled pitches, rhythmic patterns, and melodic phrases and asked children to echo them, both individually and as a group.

Additionally, children were encouraged to create their own movements while singing (e.g., clapping, toe-tapping, snapping fingers, dancing). They were also asked to demonstrate the songs to one other using movement (e.g., hand signals, gestures, pantomime). Movements were encouraged in these song demonstrations during the pre-treatment phase, particularly to provide the researcher with information about the participants’ ability to translate music into body movement, the freedom with which they were able to incorporate movement with various aspects of the songs, and how they generally responded to movement instruction. Although movements were observed and encouraged during this orientation, the information gathered during this phase was not used for analysis in the study. Rather, the researcher used this preparation for treatment to gather more qualitative information about how movement can be both an automatic response to songs, as
well as a response that has been elicited by teacher prompting.

Once the pre-treatment preparation phase was complete, the actual research treatment procedures began. Four intact first-grade classes were randomly assigned to two treatment groups - Group I and Group II. The treatment was counterbalanced to minimize confounding effects. Specifically, Group I learned Song A accompanied with movements (W/M: Singing with Movements) and Song B (see Appendix E) with non-movement (N/M: Singing with Non-Movement), while Group II learned Song A with non-movement (N/M) and Song B with movements (W/M). The study included one independent, between-subjects variable: condition, with two levels (W/M: movement-instruction and N/M: non-movement instruction). Four dependent variables: text (T), pitch (P), rhythm (R), and melodic contour (C) were also selected for study.

For the purposes of Experiment 1, the treatment and the first recording of student performances (Test 1) took place at the beginning of the school week. Treatment was administered by the music teacher and consisted of both a song-learning phase and a rehearsal phase. During the treatment, the teacher introduced participants to the two new songs; one song was taught with movements and the other
was taught without movements. Both Song A “Clap Your Hands Together” and Song B “All around the Buttercup” were taught using the whole-song approach.

The process of teaching the song with movements followed the same “whole-song-approach” that was used in teaching the song without movement, but was modified by adding movements during the instruction. The researcher-designed creative movements were developed for participants to expressively follow and depict the text and the music (see Appendix F). Movements were very simple and occurred on the beat to facilitate the child-developmental approach, as used by Kodály educators. After children learned Song A and Song B, each treatment group performed the songs (as a group), one song with movements and the other without movements.

After the learning and group rehearsal phase, the researcher immediately administered Test 1 using an individual recording of song retrieval to assess immediate participant recall of song components (Sloboda, 2002). One at a time, participants were removed from the group and taken into a separate room where they were asked to perform the same songs they had just learned and rehearsed with the group. The researcher gave a starting pitch by using the tuning fork and counted off in a moderate tempo “One, two,
ready sing.” The individual participant performances were recorded with a digital voice recorder, Olympus (VN-4100PC), and each student’s audio file was number coded to ensure confidentiality and later allow for ease of comparison with subsequent responses.

Test 2 took place at the end of the treatment week, which was also the next regularly scheduled music class. Test 2 involved the second recording of individual retrieval of song material. This test was conducted to gather additional information about participants’ song learning and recall, specifically the accuracy of their song recall after a short period of time. For the purpose of review and as a class, students sang Song A and Song B all the way through (the same way they were taught earlier in the week before Test 1.)

Following the practice period, the researcher recorded each student’s performance again, following the same procedure as during the first testing session. Children were removed from the intact classroom one at a time, were taken to a separate room, and were recorded singing the songs they had just learned and rehearsed in the classroom with the group. As in the first session, the researcher gave a starting pitch and counted off for participants, “One, two, ready sing.” Each performance was recorded and
was number coded to match that child’s audio file number from Test 1.

After one week of no music instruction or testing, the researcher proceeded with Experiment 2, which was aimed at gathering information about which type of movement (locomotor or nonlocomotor) would be most effective in fostering accurate learning and recall of song elements. Participants for Experiment 2 were the same participants from the same sample that were studied in Experiment 1. (Note: Experiment 2 included nine additional participants who were absent during the two testing periods of Experiment 1; however, only the 83 participants who completed both experiments and both testing periods were included in the final analysis). As in the previous experiment, the participants were randomly assigned to the treatment groups based on the four intact music classrooms. Procedures for Experiment 2 were exactly the same as Experiment 1.

As a group, participants were taught two new songs (in this experiment – Song C and Song D) with the whole-song approach, and then rehearsed the songs with the group. The only difference between the two experiments was with regard to the method of instruction. Experiment 1 employed
movement and non-movement instruction, while Experiment 2 employed locomotor and nonlocomotor movement.

Like Experiment 1, the treatment in Experiment 2 was counterbalanced to avoid confounding effects. Thus, song C was taught using locomotor movements (LM), while Song D was accompanied by non-locomotor movements (NL). The researcher-designed creative locomotor and nonlocomotor movements were used in order to expressively follow and depict the text and the music (see Appendix G). These movements were very simple and occurred on the beat, again following the child-developmental approach used by Kodály educators.

After the initial treatment performed by the music teacher (song learning with the whole-song approach and group rehearsal), Test 3 was used to assess the success of the treatment, or the accuracy of initial song learning. As in Experiment 1, the researcher administered the test in a separate room with individual children. Students’ performances were digitally recorded and number-coded in order to link Test 3 and Test 4 responses to the same participant. The researcher provided the same starting tempo and count-off as in the testing phases of Experiment 1.
The second measurement (Test 4) took place during the next regularly scheduled music class, which was at the end of Experiment 2 treatment week. All students were allowed to sing entire songs through as a review without the help of the researcher. Then, the researcher individually recorded each student’s performance, following the same procedure as in the other tests. With a starting tempo and count-off prompt, individuals performed the songs, performances were recorded, and files were number coded for clarity of data.

Once all data had been gathered for both test sessions in Experiment 1 and both test sessions in Experiment 2, the researcher began statistical analyses to determine the results of the treatment. The results of these statistical tests are outlined and explained in the following chapter.
CHAPTER IV
RESULTS AND ANALYSIS

There were two purposes in the current study: (1) to investigate the effects of movement instruction on memorization and retention of new song material in first-grade students; and (2) to explore the specific types of movement (locomotor and nonlocomotor) used in music instruction, and the impact of each type on memorization and retention of new song material. Participants for the study were first-grade students for Experiment 1 ($N = 83$) and the same first-grade students (plus 9 additional participants) for Experiment 2 ($N = 92$); all participants were selected from intact classrooms within a public school in Northeast Ohio. Only participants who took part in both testing sessions of both experiments were included in the final analysis.

Results of each experiment are presented separately and examined by the variables. Data were analyzed using Kolmogorov-Smirnov Test for normality of variance, (2) Wilcoxon Signed Rank Test, and (3) Kruskal-Wallace Test.
Descriptive statistics for all variables were computed using Statistical Package for the Social Sciences (SPSS, 18.0) available at Kent State University.

Two musical experts evaluated and scored each recorded response of students’ performances. Each song was scored for number of performance errors in four categories: text (T), pitch (P), rhythmic accuracy (R), and melodic contour (C). Errors were recorded as the number of times students failed to remember the correct word, pitch, rhythmic value, or melodic contour in a song. In the case of melodic contour, only one error per phrase was possible (i.e., there was a total of four possible errors per song if the song consisted of four phrases), whereas in the remaining categories, each incorrect pitch, duration value, or word were counted. The total possible number of errors was 71 for Song A and 65 for Song B. The total number of possible errors was 123 for Song C and 117 for Song D.

The four songs used in Experiment 1 and Experiment 2 were chosen because of their similar musical structures and characteristics (i.e., same range, key, time signature, and rhythmical values). Every attempt was made to find songs that were similar in structure, so that consistency could be achieved; controlling for the songs allowed more emphasis to be placed on the treatment (type of
instruction) as the variable of interest. Given that the total possible number of errors per song was different, participants’ performances (number of errors they made) were recalculated as percentages for each variable. The statistical analyses of the data were performed on these percentage scores.

Descriptive statistics were calculated for all variables and distribution was examined for normality. Data were analyzed using Kolmogorov-Smirnov test. These results revealed that data deviated significantly from a normal distribution for each variable; hence, a non-parametric approach was used to analyze the data.

The total number of errors across all groups and regardless of the treatment type (movement or non-movement instruction) was averaged for each song in order to compare the level of difficulty. The average number of errors for song A was 7.75 or 11% of the total possible number of errors (71). The average number of errors for song B was 5.89 or 9% of the total possible number of errors (65). Similarly, the total number of errors across all groups and despite the method of instruction (locomotor movement vs. nonlocomotor movement) was averaged for each song in Experiment 2 in order to compare the level of difficulty. The average number of errors for Song C was 14.75, which is
12% of the total possible number of errors. The average number of errors for Song D was 11.18, which was 10% of the total possible number of errors.

By simply comparing the numbers, one could conclude that songs A, B, C and D contained similar structures, similar characteristics, and students responded in a similar way to the teaching and rehearsal of the songs. By the same conclusion, student responses to the songs indicated that the level of difficulty for all four songs was similar.

In order to further examine the differences between Song A and Song B, the Kruskal-Wallis test was employed for each of the four dependent variables (text, pitch, rhythm and melodic contour), across both methods of instruction. A Bonferroni correction was applied so all effects are reported at a .0125 level of significance. The results of the analysis indicated that there was no significant difference between the two songs for the text, for the rhythm, and for the melodic contour. However, results revealed significant difference for pitch \([H (1) = 28.98]\). Figure 2 represents the percentage of the total number of errors for each variable (text, pitch, rhythm and melodic contour), for movement/non-movement instruction and both groups together.
Figure 2. Percentage of the Total Number of Errors for Each Variable (Text, Pitch, Rhythm and Melodic Contour), for Movement/Non-Movement Instruction and Both Groups.

The same tests were used to compare Song C and Song D; a Kruskal-Wallis test was employed for each of the four dependent variables (text, pitch, rhythm and melodic contour). A Bonferroni correction was applied and all effects are reported at a .0125 level of significance. The results of the analysis indicated that there was no significant difference for the variables pitch, rhythm, and melodic contour. Nevertheless, results revealed significant difference for text \((H (1) = 12.97)\).
Figure 3. The Total Number of Errors for Each Variable (Text, Pitch, Rhythm and Melodic Contour), for Locomotor/Nonlocomotor Movement Instruction and Both Groups.

After completing the song comparison for consistency, difficulty level, and students’ responses in terms of errors, it was found that both pairs of songs (A and B) and (C and D) were statistically different with respect to only one out of four variables. Therefore, the songs were treated as comparable for the purposes of data analysis. Hence, the following references to any of the four variables (text, pitch, rhythm, or melodic contour) will refer to Song A and Song B as a unit of analysis for Experiment 1, and Song C and Song D as a unit of analysis for Experiment 2.
The total number of errors for both songs together (A and B) was calculated, regardless of the type of instruction, and Group 1 and Group 2 were compared. Each testing session (Test 1 and Test 2) was analyzed separately. A Kruskal-Wallis test with test session as a between-group factor was carried out for each variable in order to determine whether there was a significant difference between Group 1 and Group 2. Significant effects were obtained in each of the following variables: pitch (P): \[ H (1) = 26.25 \] rhythm (R): \[ H (1) = 12.64 \], and melodic contour (C): \[ H (1) = 11.88 \]. However, in terms of text, the two groups were not significantly different. However, when both groups were tested a second time (Test 2), the two groups were significantly different only for the variable of pitch \[ H (1) = 39.67 \]. No other significant differences were found.

The total number of errors for both songs together (song A and song B, grouped by song variables), and both treatments (movement and non-movement instruction), for each testing session (Test 1 and Test 2) were compared (see Figure 4).
To determine potential differences between treatment type, a number of errors for each of the four variables (text, pitch, rhythm, and melodic contour) were analyzed separately using Wilcoxon Signed Ranks Tests. A Bonferroni correction was applied and all effects were reported at a .0125 level of significance.

Tests and analyses were completed in order to help answer each of the research questions, beginning with research question #1: Does movement-based instruction affect memorization and retention of text?

Mean scores and standard deviations for text errors for Test 1 and Test 2 are summarized in Table 1.
Participants made fewer text errors when treated with movement instruction \((M = .15)\) than participants who learned songs with no movement \((M = .23)\). When participants were tested a second time, only days later (Test 2), results indicated fewer text errors for songs learned with movements \((M = .07)\) than with non-movement \((M = .14)\).

Table 1

<table>
<thead>
<tr>
<th>Method of Instruction</th>
<th>Test 1</th>
<th>Test 2</th>
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<tbody>
<tr>
<td></td>
<td>(N)</td>
<td>(M)</td>
</tr>
<tr>
<td>Movement</td>
<td>83</td>
<td>.15</td>
</tr>
<tr>
<td>Non-Movement</td>
<td>83</td>
<td>.23</td>
</tr>
</tbody>
</table>

A Wilcoxon test was conducted to evaluate whether students memorized text better under the movement or non-movement conditions. The results revealed a significant difference, \(z = -2.47, p < .0125, r = -.27\), after the initial treatment and testing (Test 1). The mean of ranks in favor of movement instruction was 26.34, while the mean of ranks for non-movement was 32.91, indicating that participants who learned songs with movement made significantly fewer text errors.

When participants' performances were recorded three days later (Test 2), the results were similar. The mean of
ranks for movement instruction was 18.78, while the mean of ranks for non-movement instruction was 28.59. The results were statistically significant, $z = -2.19, p < .0125, r = -.24$. This is in accordance with the previous testing, confirming that participants who were instructed with movements produced significantly fewer text mistakes.

In order to examine whether movement instruction made any difference in retention of song material after a short period of time (a few days later), the results of Test 1 and Test 2 were compared. The Wilcoxon test revealed that the mean of ranks for text errors, under the movement condition was 25.17 (Test 1), while the mean of ranks after the second testing session (Test 2) was 28.40. The test results were: $z = -3.15, p < .0125, r = -.35$, indicating that students who were taught with movements made significantly fewer text errors when tested immediately after the treatment (Test 1).

Results of the Wilcoxon test for non-movement instruction were as follows: the mean of ranks for text errors (Test 1) was 26.44, while the mean of ranks for text errors (Test 2) was 27.26, $z = -2.36, p < .0125, r = -.26$, indicating that students made significantly fewer text errors during immediate testing (Test 1), when treated without movement instruction.
Similar statistical analysis was used to answer research question #2: Does movement-based instruction affect memorization and retention of pitch?

Table 2 reflects means and standard deviations for pitch errors. Although very close, the mean value for movement instruction ($M = .79$) showed that participants made fewer pitch errors during non-movement instruction ($M = .82$). Interestingly enough, when tested the second time (after a few days), movement instruction resulted in more pitch errors ($M = .85$) than non-movement instruction ($M = .82$).

Table 2

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<th>Test 1</th>
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<th>Test 2</th>
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<td></td>
<td>$N$</td>
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<td>$SD$</td>
<td>$N$</td>
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<tr>
<td>Movement</td>
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<td>.79</td>
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<td>83</td>
</tr>
<tr>
<td>Non-Movement</td>
<td>83</td>
<td>.82</td>
<td>.35</td>
<td>83</td>
</tr>
</tbody>
</table>

In order to determine possible differences between the two methods of instruction on memorization of pitch, results of the Wilcoxon test showed that the mean of ranks for movement instruction was 33.90, while the mean of ranks for non-movement instruction was 45.90. The $z$-score showed no statistically significant difference between movement
and non-movement instruction condition, as measured immediately after the initial treatment procedure (Test 1). Additionally, no significant difference was found when participants were tested during Test 2. Mean of ranks for movement instruction was 39.85, while the value of mean of ranks for non-movement instruction was 42.86, indicating that participants made fewer pitch errors when instructed with movement.

When comparing the pitch errors for songs taught with movement instruction, Wilcoxon test revealed that students made fewer errors the second time (Test 2) with a mean of ranks at 17.02, while the first time (Test 1) the mean of ranks was 20.45. However, the results were not significantly different. Similarly, when pitch errors were examined for non-movement instruction, results showed that the mean of ranks for pitch errors were 18.36 (Test 1) and 18.64 (Test 2), and that the difference was not significant.

Like the previous research questions, statistical results were used to analyze the memorization of rhythm, specified in research question #3: Does movement-based instruction affect memorization and retention of rhythm?

The means and standard deviations for rhythm errors are presented in Table 3. Participants who were treated
with movement instruction exhibited fewer rhythm errors \((M = .13)\) in Test 1 than participants who were treated without movement instruction \((M = .24)\), indicating that treatment with movement instruction led to more accurate recall of rhythm during Test 1. The same pattern occurred during the second test situation (Test 2). Participants who were treated with movements scored lower \((M = .08)\) than participants who were treated without movements \((M = .16)\), indicating that movement instruction produced fewer rhythm errors.

Table 3

<table>
<thead>
<tr>
<th>Method of Instruction</th>
<th>Test 1</th>
<th>Test 2</th>
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</thead>
<tbody>
<tr>
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<td>M</td>
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<tr>
<td>Movement</td>
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<td>.13</td>
</tr>
<tr>
<td>Non-Movement</td>
<td>83</td>
<td>.24</td>
</tr>
</tbody>
</table>

To explore differences in memorization of rhythm, immediately after the treatment (Time 1), the data were analyzed using a Wilcoxon test. The results demonstrated statistically significant differences between the two treatments: \(z = -3.67, p < .0125, r = -.40\). The mean of ranks for movement treatment was 23.44, while the mean of ranks for non-movement treatment was 32.65, indicating that
participants made significantly fewer rhythm errors while using movements. When examined the second time (Test 2), the mean of ranks for movement treatment was 20.43, while the mean of ranks for non-movement treatment was 30.08. Results indicated a statistically significant difference in treatment type, $z = -2.72$, $p < .0125$, $r = -.29$. Again, movement instruction led to significantly fewer rhythm errors.

Again, a Wilcoxon test was carried out to examine memorization of rhythm and possible differences between the two testing sessions (Test 1 and Test 2). The results showed that the mean of ranks for rhythm, when presented with movement right after the treatment (Test 1), was 22.33 while the mean of ranks for Test 2 was 27.53. Test results, $z = -3.08$, $p < .0125$, $r = -.34$), indicated that participants made significantly more rhythm errors after the second measurement (Test 2). Likewise, when presented without movements, memorization of rhythm showed the same direction as with movement instruction. Specifically, results of the Wilcoxon test revealed that the mean of ranks for rhythm without movements was 29.58 (Test 1) while the mean of ranks for Test 2 was 30.88, $z = -2.59$, $p < .0125$, $(p = .010)$, $r = -.28$, indicating that the
participants performed the rhythm significantly better when tested immediately after the initial treatment in Test 1.

Research question #4 was used to explore specifics about melodic contour: Does movement-based instruction affect memorization and retention of melodic contour?

Mean scores and standard deviations for melodic contour errors for Test 1 and Test 2 are summarized in Table 4. Examination of this table reveals that participants, when tested during the first testing session (Test 1), made more melodic contour errors when treated with movement instruction ($M = .66$) than when treated without movement instruction ($M = .63$). Again, when tested the second time (Test 2), participants made more melodic contour errors after learning songs with movements ($M = .50$) than for songs learned with no movement ($M = .44$).

Table 4

<table>
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<tr>
<th></th>
<th>Test 1</th>
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<th>Test 2</th>
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<tbody>
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<td></td>
<td>$N$</td>
<td>$M$</td>
<td>$SD$</td>
<td>$N$</td>
<td>$M$</td>
</tr>
<tr>
<td>Movement</td>
<td>83</td>
<td>.66</td>
<td>.37</td>
<td>83</td>
<td>.50</td>
</tr>
<tr>
<td>Non-Movement</td>
<td>83</td>
<td>.62</td>
<td>.38</td>
<td>83</td>
<td>.44</td>
</tr>
</tbody>
</table>

A Wilcoxon test was conducted to evaluate whether students learned melodic contour better after treatment
with movement or non-movement instruction. The results revealed no significant difference for Test 1. The mean of the ranks in favor of non-movement was 25.68, while the mean of the ranks in favor of movement instruction was 26.24, indicating that participants who learned songs with movements did not differ significantly from the group who learned the song with non-movement instruction.

The findings were similar for Test 2. The mean of ranks for non-movement instruction was 25.91, while the mean of ranks for movement instruction was 27.77. The resulting z score was not statistically significant. This conclusion indicated that treatment with movement instruction did not make a difference when memorization of melodic contour was in question.

Results of the Wilcoxon test for melodic contour showed that students who were treated with movement instruction made fewer melodic errors when tested right after the treatment (Test 1) than those treated without movement instruction. The mean of ranks was 24.10 and 29.46 respectively. Given that \( z = -3.47, p < .0125, r = - .38 \), this difference is significant. Memorization of melodic contour, when participants were treated with non-movement instruction was also significantly different when examined at two different recall intervals (immediate during Test 1
and several days later during Test 2), $z = -3.49$, $p < .0125$, $r = -.38$. The mean of ranks for Test 1 was 31.29, while the mean of ranks for Test 2 was 27.74.

The percentage of performance errors was identified for each of the four variables: text-movement (TM), pitch-movement (PM), rhythm-movement (RM), melodic contour-movement (CM), text-no/movement (TN), pitch-no/movement (PN), rhythm-no/movement (RN), and melodic contour-no/movement (CN)] during Test 1 and Test 2, and for each type of treatment (movement vs. non-movement instruction) (see Figure 5).

![Figure 5. Percentage of Errors by Test, Treatment Type & Song Variable for Experiment 1](image-url)
Another Wilcoxon test was carried out to compare the percentage of errors for each variable, regardless of treatment type, and across Test 1 and Test 2. The results showed that the mean of ranks for text for Test 1 was 55.00 while the mean of ranks for Test 2 was 51.66. Test results, \((z = -3.84, \ p < .0125, \ r = -.29)\), indicated that participants made significantly fewer text errors after a few days in Test 2. Test results revealed the same pattern of results for pitch. Participants performed better after the second recording session (Test 2), although not significantly. The mean of ranks was 38.27 for Test 1 and 34.52 for Test 2. The Wilcoxon test further revealed that students made fewer rhythm errors in Test 2, with a mean of ranks at 52.21, while immediate testing (Test 1) resulted in a mean of ranks that was 57.68. Test results revealed a statistically significant difference, \(z = -3.93, \ p < .0125, \ r = -.09\). The mean of ranks for melodic contour was 56.55 for Test 1 and 54.28 for Test 2. These results were as follows: \(z = -4.90, \ p < .0125, \ r = -.38, \) thus revealing a significant difference.

Figure 6 represents the percentage of errors that both groups made for both songs together, not accounting for treatment type or testing session.
Figure 6. Percentage of Errors by Group & Song Variable for Experiment 1

It is interesting to observe that the variable with the highest number of errors was pitch (72% for Group 1 and 90% for Group 2), followed by melodic contour (48% for Group 1 and 62% for Group 2). The percentage of errors was much lower for text and rhythm; students in Group 1 made 12% of the errors for text and students in Group 2 made 17% of the text errors, while Group 1 made 10% of rhythm errors and Group 2 made 19% of rhythm errors.

Descriptive statistics were calculated for Experiment 2, to further examine the specific type of movement treatment (locomotor or nonlocomotor) that would be most effective in reducing song recall errors. Statistical
results with regard to all variables and distribution was examined for normality. Because the results of a Kolmogorov-Smirnov test for normality of variance revealed that data were not normally distributed, the data were again analyzed using nonparametric procedures.

Group 1 and Group 2 were compared to determine if there were any differences in the total number of errors for Song C and Song D as a unit. This comparison did not take into account the method of instruction. This comparison was used to analyze differences in memorization of music material between the two sessions, specifically Test 3 and Test 4.

Results of the Kruskal-Wallis test for each variable (text, pitch, rhythm, and melodic contour) revealed no significant difference among the total number of errors when participants were tested immediately after the treatment (Test 3). When tested the second time, a few days later (Test 4), the results were similar to the results for Test 3, revealing no statistically significant difference. Figure 7 illustrates the total percentage of song errors made by each group, for each testing session, and for each song variable in Experiment 2.
In order to determine percentage of error differences in the specific movement treatment type (locomotor and nonlocomotor instruction) and for each song variable (text, pitch, rhythm, and melody), the variables were analyzed separately using the Wilcoxon Signed Ranks Tests.

The impact of the specific type of movement treatment on text recall accuracy was explored with research question #5: Does movement type (nonlocomotor or locomotor), used in the process of instruction affect memorization and retention of text?

Mean scores and standard deviations for text errors for Test 3 and Test 4 are presented in Table 5. Examination
of this table revealed a slight difference between the two types of movements: participants made fewer text errors when learning songs with locomotor movements \((M = .22)\) than participants who learned songs with nonlocomotor movements \((M = .24)\). This difference is even smaller when participants were tested a second time (Test 4), but this time participants made fewer text errors in songs learned with nonlocomotor movements \((M = .09)\) than with locomotor movements \((M = .10)\). However, participants made fewer errors after the second testing.

Table 5

Means and Standard Deviations for Text Errors by Method of Instruction and Test 3/Test 4

<table>
<thead>
<tr>
<th>Method of Instruction</th>
<th>Test 3</th>
<th>Test 4</th>
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<tbody>
<tr>
<td></td>
<td>N</td>
<td>M</td>
</tr>
<tr>
<td>Locomotor Movement</td>
<td>92</td>
<td>.22</td>
</tr>
<tr>
<td>Nonlocomotor Movement</td>
<td>92</td>
<td>.24</td>
</tr>
</tbody>
</table>

The Wilcoxon test was carried out to determine whether students memorized text better after treatment with locomotor movement instruction or nonlocomotor movement instruction while learning a new song. The mean of ranks in
favor of locomotor movements was 39.82, while the mean of ranks in favor of nonlocomotor movements was 46.46. Although students made fewer text errors in testing after treatment with locomotor movements, the difference was not significant for Test 3.

However, the results for Test 4 were different. The mean of ranks for locomotor movements was 36.24, while the mean of ranks for nonlocomotor movements was 28.98, indicating that participants made more text errors in testing after treatment with locomotor movement instruction. However, the difference was not statistically significant.

To further examine if the specific type of movement treatment (locomotor or nonlocomotor) made any difference in memorization of music material after a few days, Test 3 responses were compared with Test 4 responses. A Wilcoxon test revealed that mean of ranks for text, when participants were presented with locomotor movement treatment, for Test 3 was 27.69, while the mean of ranks for Test 4 was 39.61 and the $z = -4.99, p < .0125, r = -.52$, thus indicating that participants treated with locomotor movements instruction made significantly fewer text errors during Test 3 than in Test 4. By the same token, results of the Wilcoxon test for nonlocomotor
movements were as follows: the mean of ranks for text errors (Test 3) was 25.35, while the mean of ranks for text errors (Test 4) was 43.20, \( z = -4.95, p < .0125, r = -.52, \) thus indicating that students made significantly fewer text errors during Test 3, when treated with nonlocomotor movement instruction.

Research question #6 was used to gather information about the effects of specific treatment type on pitch: Does movement type (nonlocomotor or locomotor), used in the process of instruction affect memorization and retention of pitch?

Table 6 illustrates means and standard deviations for pitch errors for Test 3 and Test 4. Participants who received the locomotor movement instruction made fewer pitch errors (\( M = .77 \)) than did participants who were instructed with nonlocomotor movements (\( M = .86 \)). During the second testing session (Test 2), results showed a pattern of responses similar to Test 1, (\( M = .77 \) and \( M = .82, \) respectively).
Table 6

Means and Standard Deviations for Pitch Errors by Method of Instruction and Test 3/Test 4

<table>
<thead>
<tr>
<th>Method of Instruction</th>
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<tbody>
<tr>
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<td>M</td>
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<tr>
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<td>.77</td>
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<tr>
<td>Nonlocomotor Movement</td>
<td>92</td>
<td>.86</td>
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</table>

In order to determine possible differences between the two types of movement treatment on memorization of pitch, results of the Wilcoxon test showed that the mean of ranks for locomotor movement was 40.24 while the mean of ranks for nonlocomotor movements was 49.77. Since the $z = -2.61$, $p < .0125$, $r = -.29$, the difference was statistically significant when measured immediately after treatment (Test 3). No significant difference was found when participants were tested after three days (Test 4). Mean of ranks for instruction with locomotor movements was 41.37, while the mean of ranks for instruction with nonlocomotor movements was 47.36, indicating that students made more text errors after treatment with nonlocomotor movement instruction.

Another Wilcoxon test was carried out to explore the retention of pitch when treated with locomotor movement
instruction. This test revealed that students made fewer errors when tested after a short period of time (Test 4) with the mean of ranks 22.35; the score for immediate testing in Test 3 mean of ranks was 27.05. However, this variation was not significantly different. It is interesting to note that when treated with nonlocomotor movements, subjects' retention of text, as recorded in Test 4, showed the opposite result. The mean of ranks for pitch errors after the immediate testing (Test 3) was 17.71, while the mean of ranks for Test 4 was 22.57, thus indicating that students made more text errors in recalling song information a few days later. However, the difference was not significant.

The specific type of movement instruction treatment was also analyzed for variation in rhythm responses, as outlined in research question #7: Does movement type (nonlocomotor or locomotor), used in the process of instruction affect memorization and retention of rhythm?

The means and standard deviations for rhythm errors are presented in Table 7. Participants who were treated with locomotor movement instruction exhibited fewer rhythm errors ($M = .22$) in Test 3 than did participants who were treated with nonlocomotor movement instruction ($M = .24$), indicating that treatment with locomotor movement
instruction led to more accurate recall of song rhythm during immediate testing (Test 3). On the contrary, during the second test situation (Test 4), participants who were treated with nonlocomotor movements scored lower ($M = .16$) than participants who were treated with locomotor movements ($M = .66$), indicating that nonlocomotor movement instruction resulted in fewer rhythm errors.

Table 7

Means and Standard Deviations for Rhythm Errors by Treatment Type and Test 3/Test 4

<table>
<thead>
<tr>
<th>Method of Instruction</th>
<th>Test 3</th>
<th>Test 4</th>
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<tbody>
<tr>
<td></td>
<td>$N$</td>
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<td>.22</td>
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<td>Nonlocomotor Movement</td>
<td>92</td>
<td>.24</td>
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</tbody>
</table>

A Wilcoxon test did not reveal a statistically significant difference between the specific types of movement treatment when the memorization of rhythm was in question. The mean of ranks for locomotor movements was 29.00, while the mean of ranks for nonlocomotor movements was 43.9. Hence, students made fewer text errors when treated with locomotor movement instruction. Test 4 measures showed that treatment with locomotor movement
instruction (18.36) was not significantly different from treatment with nonlocomotor movements (22.93) for rhythm.

A Wilcoxon test was again carried out to examine memorization of rhythm and possible differences between Test 3 and Test 4. When participants were treated with locomotor movement instruction and tested, the results showed that the mean of ranks for rhythm during Test 3 was 19.13, while the mean of ranks for Test 4 was 33.91. Since the \( z = -5.15, p < .0125, r = -.54 \), results indicated that students made significantly more rhythm errors after the second measurement (Test 4). Likewise, when treated with nonlocomotor movements, memorization of rhythm showed the same pattern. Results of the Wilcoxon test revealed that the median of ranks for rhythm without movements was 16.68 (Test 3), while the median of ranks for Test 4 was 27.41, \( z = -4.27, p < .0125, r = -.45 \).

The variable of melodic contour was the focus of research question #8: Does movement type (nonlocomotor or locomotor), used in the process of instruction affect memorization and retention of melodic contour?

Mean scores and standard deviations for melodic contour errors for Test 1 and Test 2 are summarized in Table 8. Examination of this table reveals that participants made more melodic contour errors (during
immediate testing) when treated with locomotor movement instruction \((M = .60)\) than when treated with nonlocomotor movement instruction \((M = .67)\). The same pattern occurred when participants were tested the second time (Test 3). Participants made more melodic contour errors after learning songs with locomotor movements \((M = .42)\) than for songs learned with nonlocomotor movements \((M = .48)\).

Table 8

Means and Standard Deviations for Melodic Contour Errors by Treatment Type and Test 3/Test 4

<table>
<thead>
<tr>
<th>Method of Instruction</th>
<th>Test 3</th>
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<th>Test 4</th>
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<tbody>
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<td></td>
<td>(N)</td>
<td>(M)</td>
<td>(SD)</td>
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<td>Nonlocomotor Movement</td>
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<td>.67</td>
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</table>

The Wilcoxon test revealed no significant difference between specific treatment types (locomotor and nonlocomotor movement instruction) for melodic contour. Furthermore, the mean of the ranks in favor of locomotor movement treatment was 22.40, while the mean of the ranks in favor of nonlocomotor movement treatment was 26.95. Test 3 data showed that participants who learned songs with locomotor movements did not differ significantly from the
group who learned the song with nonlocomotor movements, although locomotor movement treatment did result in fewer text melodic contour errors. Also, there was no significant difference between specific treatment types (locomotor and nonlocomotor movement instruction) during Test 4. The means of ranks were 25.14 and 25.76, respectively.

Results of Wilcoxon test for melodic contour (C) showed that students who were treated with locomotor movement instruction made fewer melodic contour errors when tested immediately after the treatment (Test 3), (mean of ranks=27.14), than when they were tested a few days later (Test 4), (mean of ranks=31.26). Since the \( z = -3.04, p < .0125, r = - .32 \), this difference is statistically significant. Memorization of melodic contour, when participants are treated with nonlocomotor movement instruction was also significantly different when examined at different recall intervals, including both immediate and short-term: \( z = -3.78, p < .0125, r = -.39 \). The mean of ranks in favor of Test 3 was 18.28, while the mean of ranks in favor of Test 4 was 30.77, indicating that students made significantly fewer melodic contour errors immediately after treatment with nonlocomotor movement instruction.

Figure 8 illustrates the percentage of performance errors for each of the four variables: text-locomotor (TL),
pitch-locomotor (PL), rhythm-locomotor (RL), melodic contour-locomotor (CL), text-nonlocomotor (TN), pitch-nonlocomotor (PN), rhythm-nonlocomotor (RN), and melodic contour-nonlocomotor (CN)]. Percentage of errors was further examined across the two testing periods (Test 1 and Test 2) and for each method of treatment (locomotor/nonlocomotor movement instruction).

Figure 8. Percentage of Errors by Test, Specific Treatment Type & Song Variable for Experiment 2

The percentage of errors is presented in Figure 9, regardless of the specific treatment type; this includes data for both groups, Song C and Song D as a unit, both Test 3 and Test 4, and for each song variable: text (T), pitch (P), rhythm (R), and melodic contour (C).
Figure 9 reveals that the variable with the highest number of errors was pitch, 79% for Group 1 and 83% for Group 2, followed by melodic contour (53% - Group 1 and 56% - Group 2). The number of errors is much lower for the variables of text and rhythm. Students in Group 1 made 16% of errors in the area of text and students in Group 2 made 16% of text errors, while Group 1 made 15% of rhythm errors and Group 2 made 13% of rhythm errors.

However, when the factor of time was taken into account, results of the Wilcoxon test revealed that participants made fewer errors in all four variables after
the second testing session (Test 4), which was administered to assess recall after a few days. Results were as follows: the mean of rank for text errors for Test 3 was 82.48 while this result for Test 4 was 51.53; the mean of rank for pitch was 44.19 for Test 3 and 44.88 for Test 4; the mean of rank for rhythm was 60.46 for Test 3 and 36.74 for Test 4; and the mean of rank for melodic contour was 61.05 for Test 3 and 46.06 for Test 4. The data revealed that scores for three variables were statistically significant. Participants made significantly fewer errors when tested the second time (Test 2) than immediately after the treatment (Test 1) for the following variables: text $z = -7.08$, $p < .0125$, $r = -.52$, rhythm $z = -6.59$, $p < .0125$, $r = -.49$ and melodic contour $z = -4.71$, $p < .0125$, $r = -.35$.

This chapter has outlined the statistical analysis procedure and the statistical results that were obtained for the current research. The following chapter will provide a discussion of the findings from this research, implications for using the findings in music education instruction, as well as recommendations for further research.
CHAPTER V

SUMMARY AND DISCUSSION

The results of the experiments and analysis of the findings have revealed several conclusions that will be meaningful in pedagogical practice and student learning with regard to music instruction, as well as general literacy and overall learning strategies. A comparison of the songs, groups, experiments, testing trials, and instructional methods served as an overall structure for this researcher’s conclusions. An analysis of the results for the selected variables (text, rhythm, pitch, and melodic contour) as well as a revisiting of multiple theories of learning and instructional strategies guided the following interpretations, discussion of the findings, implications, and suggestions for further research.

Summary of the Results

Because the purpose of this research was to determine the effects of movement instruction on memorization and retention, the interpretations and discussion will be organized by song variable.
Accurate learning and recall of text material within a song was the focus of the first research question: Does movement-based instruction affect memorization and retention of text? Despite the fact that text was one of the easiest components for children to duplicate, testing showed that both groups scored at 16% for text errors.

Analysis of the data revealed a statistically significant difference in the memorization of text after treatment (instruction) with movements. Participants who were instructed with movements performed better than participants instructed without movements, for both Test 1 and Test 2. It was clear from this analysis that treatment with movements positively influenced memorization and retention of text. This finding agrees with previous research by Raisner (2002) and Reeves (1997), who found that movement was related to language acquisition, and therefore, positively impacted outcomes for the text (Gromko, 2005) in music learning and memorization.

Furthermore, results of the initial testing session (Test 1) revealed significantly fewer text errors than during the second testing session (Test 2), regardless of the type of instruction. For both types of instruction (with movement or without movement) students exhibited fewer text errors, right after the treatment. Errors
increased when the duration of time between learning and recall increased.

Text was also the focus of research question 5: Does movement type (nonlocomotor and locomotor), used in the process of instruction affect memorization and retention of text?

In a comparison of specific types of instruction (locomotor and nonlocomotor movement), there was no statistically significant difference in text errors. Although the type of instruction was not significant, it is interesting to note that after being taught with locomotor movements, participants made fewer text errors in Test 3, but more text errors in Test 4, or the later recall test.

Findings that compared the initial memorization of text (Test 3) and retention of text (Test 4) were statistically significant. Regardless of the type of movement instruction, there were fewer text errors when participants were tested immediately after song learning (Test 3), while later testing of the retention (Test 4) resulted in more text errors. Thus, participants were more text-accurate after the initial testing of song memorization than they were in measures of text retention after a short time.
Pitch was the musical element of interest in research question 2: Does movement-based instruction affect memorization and retention of pitch? Data analysis revealed that pitch was the variable with the most errors for both groups, reaching 79% for Group 1 and 83% for Group 2. When pitch was examined, right after the initial song-learning phase (Test 1), results showed that movement instruction led to fewer errors than non-movement instruction. However, this difference was not statistically significant.

On the contrary, when tested the second time (Test 2), participants made more pitch errors when instructed with movements than with no movements. Nevertheless, neither result was statistically significant. Results indicated that the type of instruction did not significantly influence the memorization of pitch. The insignificant results of this variable suggest that movement instruction did not have an impact on pitch memorization.

Pitch was ultimately the most difficult aspect of the song for students to reproduce effectively and was more difficult in the later recall phase (Test 2) than in the initial phase of testing (Test 1, when instruction did not include movements. Therefore, participants who learned and performed songs with movements scored better in terms of pitch memorization after a few days. It can be suggested
then, that pitch memorization, accompanied by movement and rehearsal, can improve pitch retention and more accurate recall. Similarly, Crumpler (1982) found that students’ pitch discrimination and identification were improved after movement (namely, Dalcroze) instruction.

Pitch was also the element of interest in research question 6: Does movement type (nonlocomotor or locomotor), used in the process of instruction affect memorization and retention of pitch?

The evaluation of pitch indicated that there was a significant difference in the number of pitch errors based on the type of instruction; students exhibited fewer errors while being taught with locomotor movements during both testing sessions (Test 3 and Test 4). These results were statistically significant. Thus, locomotor instruction positively affected pitch memorization and retention. Specifically, locomotor instruction resulted in fewer pitch errors in both initial learning and recall of song material.

Rhythm was identified as the song variable of interest in research question 3: Does movement-based instruction affect memorization and retention of rhythm?

Rhythm accuracy was assessed for both groups. The total number of errors for Group 1 was 15% and was 13% for
Group 2. In the more specific analysis of rhythm, the results showed a significant difference in the memorization of rhythm. Participants exhibited fewer errors when presented with movement instruction in the initial testing phase (Test 1). The song retention results indicated a positive, but not significant, influence of movement-based instruction after a few days (Test 2).

It appears that using movement as a part of the instructional process was helpful in the initial memorization of rhythm. According to the findings, the use of movement instruction significantly enhanced the memorization, or initial learning, of rhythm. However, when examined after a few days, retention of rhythm was not significantly impacted by movement instruction.

An analysis of rhythm and movement resulted in fewer rhythmic errors when participants were tested the first time (Test 1) than after the second testing (Test 2). Although neither result was statistically significant, movement instruction showed a tendency to positively influence the retention of rhythm.

Rhythm was also examined in research question 7: Does movement type (nonlocomotor or locomotor), used in the process of instruction affect memorization and retention of rhythm? Differences in rhythm errors for participants
taught with locomotor or nonlocomotor movement instruction were not significant. For rhythm, locomotor and nonlocomotor instruction showed comparable results. Participants showed fewer rhythm errors when taught with locomotor movements during both Test 3 and Test 4. However, the difference in these errors was not significant.

These results indicate that the type of movement instruction did not impact rhythm errors in performance. Neither type of movement instruction changed the initial learning or the memorization of the song’s rhythm. Although some rhythm results were not statistically significant, students with locomotor instruction showed fewer errors during both initial song-learning and song-retrieval.

Interestingly, regardless of the type of movement, participants demonstrated significantly fewer errors after the initial learning (Test 3) than after a few days (Test 4). Results indicated that movement instruction significantly influenced memorization of rhythm in the initial learning phase, which was supported by previous research (Blasedell, 1991; Joseph, 1982; Rose, 1995; Rohwer, 1998; Moore, 1984).

Research question 4 was designed to help discover information about melodic contour: Does movement-based instruction affect memorization and retention of melodic
contour? Melodic contour errors were common for participants in this research, resulting in 53% for Group 1 and 56% for Group 2. Although this musical element could be considered an area of difficulty for young participants, there are some statistically significant findings that can inform future research and educational practices.

Although melodic contour errors were less common in the initial testing (Test 1), movement instruction did not impact the errors for short-term retention of melodic contour. Results indicated that there was no significant difference between movement and non-movement instruction for Test 1 and Test 2. Movement did not differ significantly in the learning or retention of melodic contour.

For both movement and non-movement instruction, the results of Test 1, when participants were tested immediately after the treatment, showed significantly fewer melodic contour errors than Test 2 (participants tested a few days later). Thus, regardless of the type of treatment, melodic contour was easier for participants to recall accurately during the initial testing, and was more difficult for them to recall accurately after a short period of time.
Melodic contour was also a focus of research question 8: Does movement type (nonlocomotor or locomotor), used in the process of instruction affect memorization and retention of melodic contour? Similar to the findings for pitch and rhythm, participants made fewer melodic contour errors when taught with locomotor movements, as indicated by results for both Test 3 and Test 4. Nevertheless, the difference in these errors was not statistically significant. Results from this study suggested that memorization of melodic contour was not significantly affected by the type of movement instruction.

The results for the melodic contour demonstrated that participants instructed with locomotor movements performed significantly better after the initial learning (Test 3) than a few days later (Test 4). Testing results were similar for students taught with nonlocomotor movement instruction. There were significantly fewer errors after the initial learning (Test 3) than a few days later (Test 4). Therefore, regardless of the type of movement instruction, melodic contour errors increased over time.

Although not significant, the impact of locomotor instruction was positive, resulting in fewer errors for melodic contour in the initial song learning phase than were observed during nonlocomotor instruction. Participants
taught with locomotor movement instruction consistently produced fewer melodic contour errors. Dowling’s (1982) research led to similar conclusions where movement instruction showed positive effects on melodic contour results; movement instruction led to fewer melodic contour errors than instruction without movement. Yet, both locomotor and nonlocomotor instruction resulted in significantly fewer initial song-learning errors than retention errors, suggesting that the type of movement did not affect the retention of melodic contour to the extent that movement in general did.

Discussion

The following discussion will outline researcher observations, speculation about specific outcomes of the study, and interesting considerations that should be noted about the current research.

Several interesting observations were noted by the researcher during the treatment. The children’s excitement about learning new songs, as noticed during this study, cannot be neglected and should be reported. During the first recording session (when the researcher audio taped their performances), some of the children acted shy and did not want to sing alone. Throughout the treatment procedure (during the second meeting), those same hesitant children
could not wait their turn to sing alone while being recorded. Some of the other children may have felt tense or anxious during the taping of their singing (e.g., three participants sang in a lower register and some children were not able to sing the entire song all the way through).

Despite the potential for unspoken anxiety about the research situation, it was observed that the participants were capable of singing accurately, even if they did not perform well during the initial testing. Specifically, the researcher overheard an example of natural and spontaneous singing while listening to students who were singing outside of the taping location. Although these students were not aware of the researcher’s presence, they were able to sing entire songs, and one participant even sang perfectly in tune, with all the pitches in the “right place.”

Significant to this research, it was found that deliberate patterns of movement were noted in both groups of children. Interestingly, before being introduced to specific movements, almost all children naturally tended to add some kind of movement of their own to the songs that were being taught. Children added gestures for the words “one, two, three” and “just choose me” in the song “All Around the Buttercup,” and clapped their hands during the
lyric, “Clap Your Hands Together.” Other children clapped their hands to the rhythm of “Dappled Pony,” or moved with the beat of “Grizzly Bear.”

Beyond expressing the natural desire to move to music, it was also evident that children used movement as a memory tool during their performances. When children had difficulty remembering the songs, music-inspired and self-initiated movements helped in the retrieval of text, rhythm, or melodic contour. The mere anticipation of movement (or the imagining of song-related movement) allowed children to continue singing when they had difficulty remembering and reproducing songs during the testing procedure.

Although movement instruction positively affected most of the variables, pitch-matching abilities were consistently poor across both experiments. Analysis of pitch revealed that this skill was problematic for young participants, resulting in the highest percentage of errors (81% for both Experiment 1 and Experiment 2). Pitch-matching is developmentally one of the last musical skills to be developed in children, so it is no wonder that the participants in this study had difficulty with this aspect of the songs.
It is plausible that participants’ lack of ability to match pitch was due to their age, level of exposure, and amount of training. As noted earlier, pitch-matching typically develops in the later stages of musical skill acquisition. The relationship between pitch-matching ability and age, or maturity, was studied by Campbell and Kassner (2002). In their discussion on the stages of song learning, these authors stated that maturity is required for accurate pitch-recall. According to Campbell and Kassner, “children who sing daily at home or in school develop in-tune singing by the end of second grade” (p. 161). Further, the last two stages in the song learning process are pitch and tonality, respectively (Campbell & Kassner, 2002).

In Test 3, the only variable affected by movement instruction was pitch. It seems that locomotor and nonlocomotor movement instruction aided both pitch matching and memorization ability. Perhaps, students’ familiarity with the testing procedures was sufficient enough to make them feel most comfortable in Experiment 2. Furthermore, the use of locomotor movements could have attributed to feeling relaxed and at ease. This finding is in accordance with the Crumpler’s (1982) study, which showed that Dalcroze movements significantly improved pitch
discrimination ability among kindergarten students. Specifically, Reeves (1987) found that locomotor movements significantly influenced pitch discrimination ability. Although results were not significant, retention of pitch was better when tested the second time (Test 4). It is possible that participants simply remembered (retained) the songs better after having sung and moved to them the first time. Albeit, the kinesthetic theory espoused by Dalcroze (1976) combines locomotor movements and sound to create a memory for music.

Overall, movement instruction significantly enhanced the initial memorization and song-learning with regard to text, rhythm, and pitch. This positive result for rhythm has also been observed in previous research where Greenberg (1976) found that rhythm was among the first song characteristics to develop in young children. Greenberg’s finding is consistent with research by Fifield (1980), who stated that rhythmic perception was more advanced than melodic perception. The use of movement, in both phases, affected the accuracy of text.

Accuracy of rhythm was better in the initial learning phase than in the retrieval phase (but the difference was not significant). Similarly, the initial learning of
melodic contour was significantly more accurate than the retrieval of the same material a week later.

To summarize, these results suggest that regardless of the type of instruction, the initial learning phase produced fewer text, rhythm, and melodic contour errors than in the recall of the same songs a few days later. Pitch results showed a similar pattern or direction, but with no significant findings. The type of instruction, namely movement-based instruction, had a statistically significant effect on memorization of text, when tested immediately after the treatment and a few days later. The effect of movement instruction was found to be statistically significant for rhythm, when tested immediately after the treatment. Specifically, locomotor movement instruction did show a significant effect on the initial memorization of pitch. In conclusion, movement instruction proved to be beneficial in the initial learning phase and memorization of text, rhythm, and pitch.

I observed that using movement and mental imagery to enhance memorization of music was not only a naturally occurring practice among first-grade students in the current study, but also appeared to be a critical component of text, pitch, rhythm, and melodic contour retrieval. Specifically, children were observed moving their bodies to
the rhythm and beat of the songs during both testing procedures. They responded to music with their bodies in different ways, and were found using movement as a tool for remembering the music. In other words, the music naturally inspired children to perform some sort of physical movement (e.g., a gesture, a hand sign, a body movement), suggesting that physical and mental imagery were used as a combined learning tool, as well as a retrieval tool.

A pioneer in the area of the musical process and representation, Seashore (1967), recognized the importance of imagery to musical thinking. He stated:

“Musical imagery is necessary in all forms of musical memory. In vivid musical memory we relive the music... The development of musical imagery is, perhaps, analogous to the development of memory. It is clear that the mental image, particularly the auditory and motor image, operates in music in the following three ways: (1) in the hearing of music; (2) in the recall of music; and (3) in the creation of music” (pp. 169-171).

Similarly, Dalcroze (1976) referred to musical movement as motor images, while Gordon (1971) called the same concept imagery for rhythm, through kinesthetic response, and tonal imagery. Imagery and sound occur together, are often paired to improve musical understanding, and can be used in harmony to retrieve song information. The idea of pairing kinesthetic activities and sound as a whole in order to create a comprehensive,
physical memory supports the work of Dalcroze, who advocated for linking the two as well. He believed that the physical body served as a moderator between sound and its mental construct.

Employing imagery with kinesthetic experience parallels aspects of Piaget’s (1969) theories, where imagery is viewed as a revived sensory experience and an internal imitation of an outward, audible gesture. Piaget identified the term *schema* to describe these comprehensive sensory experiences composed of a set of ideas, actions, or perceptions that go together. This developmental explanation supports the notion that movement in music instruction is important for learning, as well as retention and retrieval; without an organized schema to understand multiple components of a song, recall would be much more difficult.

This process of initially creating a mental image of the physical movement and then eventually retrieving the mental image during song recall was a fascinating aspect of this research that would require additional exploration. More recent research has also been conducted to examine the broader relationship between physical body movements and the mind (particularly in physical education courses and overall academic achievement). Chomitz, Slining, McGowan,
Mitchell, Dawson, & Hacker (2009) reported that physical activity has positive effects on cognition and concentration, as well as on learning and memory.

The results of the current research and the critical links to theory and research trends indicate that there are a number of implications for teaching that can be effective in enhancing song-learning as well as overall academic achievement. General and specific implications for movement-based instruction are described.

Implications

Results of the current research indicate that there are multiple factors that can influence memorization of music. Although research indicates that prior music knowledge, readiness to learn, ability level, and type of instruction can impact song-learning and memorization, the current research was focused on the impact of movement and the specific type of movement on song memorization. Given knowledge about the influence of movement on text, pitch, rhythm, and melodic contour, teachers can tailor instruction to improve the accuracy of learning song material with young children. Based on these findings, there are a number of implications for early childhood music instruction.
Teachers should enter the classroom with basic knowledge of theories related to learning and development and how they can be used to inform practice. It is equally important that all in-service teachers, planning to teach music, have some knowledge of research in music education. Jinyoung (2000) observed that early childhood educators are not adequately familiar with the research findings concerning children's musical development; and that even when results of research studies are known they are often not implemented into early childhood practice to a desirable extent. What purpose does this research serve if it is not being utilized in pedagogical practice? Educators should be encouraged to study past and current research about the best practices for music instruction, learning, retention, and recall, and how these practices can impact other areas of development and learning.

Miller (1983) recognized that “the knowledge of how young children develop in different areas will provide a greater understanding of their musical development” (p. 8). A specific example of how music education research can inform practice is evident in the work of Rutkowski (1996), who suggested that shorter, more frequent music lessons (twice a week for 15-20 minutes) were more effective than once a week for 30 minutes, specifically for kindergartner-
age children. Developmentally appropriate suggestions like this are easy to implement and can have a tremendous impact on learning when teachers are aware of their students' capabilities and developmental levels.

Using the constructs of developmental theorists like Piaget can help to provide a better understanding of how children learn, how they learn music and how they learn at different stages of development. Piaget posits that learning occurs in the context of an environment, learning is a sensory experience, and learners construct their knowledge by building cognitive structures, mental maps, or schema to organize their thoughts and understanding (Abeles, Hoffer, & Klotman, 1995).

Specifically, according to Piaget’s proposed pre-operational stage of development (the age of the participants in this study), children learn actively and primarily through a representation of images and words together. It is in this stage that children begin to think abstractly and in terms of mental representations, even in the absence of actual objects. These principles, based in developmental theory, provide support for the idea that music instruction with movement is a natural, developmentally appropriate and effective way of helping children learn new information.
Outcomes for the different variables of text, pitch, rhythm, and melodic contour indicate that, in some instances, pairing or chunking of information helps in the memorization of a song. In line with information processing theories, Chen-Hafteck (1999) argued that the integration of text and melody exist at different levels and various degrees in children’s song-learning process. Additionally, she concluded that text and melody are integrated in one’s cognitive process and therefore, teachers should teach song lyrics and tunes at the same time.

Beyond the basics of pairing information for processing and better retention, there are higher-level cognitive processes inherent in the song-learning process. A mnemonic, or a memory-enhancing device, is a relatively simple way that students can group unfamiliar or dissociated pieces of information into an organized structure. Abeles, Hoffer & Klotman (1995) stated that organized and systematically stored information are better memorized and easily retrieved.

Once the mental representation has been created as a unified structure of once random parts, aspects of the representation become intertwined so that recall of the information is mutually suggestive. In other words, mental
representation can help in the recall of the content, and content can help in the recall of mental representation.

This strategy of using a mnemonic was naturally and obviously used in the current research, regardless of whether or not children were aware of what they were doing or thinking. Uniquely, in this study the mnemonic was a device that incorporated actual physical movement and the abstraction of the movement into a mental representation. The kinesthetic mnemonic paired with the learning of songs (including text, pitch, rhythm, and melodic contour) helped to facilitate retrieval of words and rhythm, and helped students perform songs accurately.

In music education, there are a number of musical elements in a song that must be learned and coded correctly in order to facilitate the most effective retrieval of information. Research about the relationship between text and melody in the song-learning process has led to some interesting conclusions. For example, Crowder, Serafine, and Repp (1990) found that the coding of lyrics and melody occurs together so that the two features are mentally linked.

Likewise, Ginsborg and Sloboda (2007) found that words and melody are often recalled in association with one another, so that retrieving one enables the retrieval of
the other. However, this process does not suggest that the words and melody are integrated to the extent that a failure to recall one accurately results in failure to recall the other. Samson and Zatorre (1991) validated the connection between text and melody, suggesting that text can cue the melody and melody can cue the text, which ultimately improves recall.

In the process of memorization, coding of information is critical to its temporary storage in short-term, working memory. Additional encoding and consolidation is required to move information to long-term memory. The sensory memory takes in information, some of which is lost while some is moved to short-term memory, which contains both iconic and acoustic components. In order for this transfer of information to occur effectively, learning must be meaningful, relevant, and organized so that encoding and chunking of information is logical. Using locomotor and nonlocomotor movement in music instruction utilizes iconic and acoustic functions of the short-term memory (Taylor, 2000).

In the process of retrieval, it is important that information has been coded effectively so that it can be quickly and accurately retrieved. Activating prior knowledge and introducing new material that builds on the
previous knowledge can help maximize the retrieval of information. Additionally, frequent and consistent rehearsal can improve retention and stimulate retrieval of song information.

Although developmental and cognitive theories have informed the implications for teaching, there are a number of additional suggestions that stem from available research as well as from the current study. For example, the current research supports more frequent music lessons for a defined period of time, ongoing repetition of learned content, and using movement to teach new song content. These suggestions take into consideration the broad approach to music instruction, and tailor it, in a developmentally appropriate way, to specific methodologies and approaches that can be used in the classroom. Finding more specific and appropriate music education approaches has the potential of improving song learning, song retention, and learning in general.

Most importantly, movement has been found to be beneficial in the process of learning and memorization of new song material, namely with regard to text, rhythm, and pitch. These findings are consistent with the work of several theorists and researchers who have found movement in education to be a valuable learning tool in language
acquisition (Edge, 2005) as well as rhythmic achievement and development (Blesedell 1991; Joseph 1982; Rohwer, 1998; Rose, 1985).

Particularly, some of Gardner’s proponents focused on the use of movement to enhance specific and general learning in the classroom situation. For example, Armstrong (2009) wanted teachers to incorporate movement and music into everyday activities in the classroom, suggesting that teachers ask students to respond to instruction with their bodies as a medium for expression (e.g., students could raise their hands in the air to indicate understanding of a particular concept). Or, students could utilize the classroom as a theater, where they could enact the text, problems, or other materials that were meant to be learned by dramatizing or role-playing. Pantomiming of concepts would require students to translate information from linguistic or logical symbol systems into purely bodily kinesthetic expression. This process adds a dimension of knowing that would otherwise be absent.

In addition to noting the general importance of using movement in everyday instruction, Armstrong (2009) took his ideas a step further and proposed several specific ideas about how to incorporate music into daily classroom experiences. Additionally, he identified the potential
benefits of music inclusion in terms of presenting new information, reviewing information, and supplementing information.

Moreover, Armstrong offered the idea that musical tones could be used as a creative tool for expressing concepts, patterns, or schemata in many subjects. For example, in order to present new material, or to musically convey the concept of a circle, a teacher might begin humming at a certain tone, drop gradually to a lower note (indicating the gradual slope of the circle), and then gradually move up toward the original tone.

To summarize important information, Armstrong (2009) suggested that teachers could use recorded musical phrases, songs, or pieces that offer a compelling summary of key points from a lesson or unit. Or, teachers could simply use music as a background to supplement verbal instruction. This pairing of content has been documented as a successful tool in learning and memorization.

Others, like Howes (2003), agreed with the use of movement in the general education classroom. Even the use of gestures and body language with sounds can help enhance abstract ideas by giving children something concrete to visualize and hear. For example, the concept of size can be introduced and reinforced through actions. To convey the
idea of something big, the teacher might illustrate for students with sweeping hand gestures and a loud, deep voice. In the same way, he or she might convey the concept of small through more contained hand gestures and soft voices and whispers (Howes, pp. 85-86). These suggestions for using movement in general education courses and everyday practices parallel results of the current study and support the work of Gardner, who believed in the fine-tuning of multiple intelligences through a variety of classroom methods.

By pairing movement with learning, such as finger tapping while spelling out words with sound, researchers have identified specific benefits to learning, for example, the Orton-Gillingham approach (Ritchie and Goeky, 2006). The Orton-Gillingham approach teaches students to learn to listen, speak, read and write by using three learning modalities: auditory, visual, and kinesthetic. These learning elements reinforce each other so that students learn spelling simultaneously with reading. Gromko’s study (2005) concluded that active music-making and the association of sound with appropriate symbols may develop cognitive processes similar to those needed for segmentation of a spoken word into its phonemes. That is,
skills learned in music transfer to children's performance on phonemic awareness tasks.

Research has shown that benefits of movement and music extend beyond the confines of the music classroom. Utilizing movement and music in daily educational practices has shown positive results on overall achievement, as well as other factors. For example, Chomitz, Slining, McGowan, Mitchell, Dawson, and Hacker, (2009) studied the relationship between physical fitness and academic achievement in urban public school children. Results showed that physical fitness was significantly beneficial for students' academic achievement (i.e., improvements were observed in grade point averages, scores on standardized tests, and grades in specific courses). Physical activity also led to positive impacts on student behavior and cognitive functioning, such as enhanced concentration, improved memory, and better classroom behavior.

Additionally, Mears (2001) proposed that integrating reading and movement utilizes the whole brain-mind-body system, and that learning to read through movement (curricular integration) is a viable alternative for literacy development. This integration of multiple subject area content engages the whole student in the learning process. Mears used reading and physical education skill
instruction to test the development of selected locomotor movements, letter sound association, and sight word recognition in kindergarten students. Conclusions indicated that combined, cross-curricular instruction significantly increased learning in kindergarten students.

This research also confirmed that integrated activities enhance learning in all applied subject areas and help to uncover the connections between diverse subjects (Mears, 2001). Mears also cited other researchers (Chisson, 1971; Cobb, Chisson, & Dais, 1975; Harris & Jones, 1982; Rauchenbach, 1996) who supported the idea that motor experiences have a positive effect on cognitive functioning and academic achievement.

Based on these findings, music educators should be challenged to build their own knowledge-base about teaching, child development, movement, and music. The music classroom can become a place that allows children to rehearse information regularly while encouraging active and physical participation in music learning. Specifically, teachers should be encouraged to employ various kinds of music-related movements to enhance learning. Students should be encouraged to practice songs throughout the entire week, regardless of whether or not there is a structured music time to do so. For example, children could
be given music assignments to practice as homework, and could be encouraged to rehearse songs in small groups or with partners. Regular classroom teachers could use daily classroom transition times to rehearse and practice songs. The use of music regularly and consistently in the classroom can help promote enthusiasm and success in learning, not only for music content, but also in the more general categories of reading and writing (Howes, 2003).

Recommendations for Further Research

Although the current research was able to answer some questions about music instruction, the impact of movement on initial learning, memorization, retention, and recall, some questions remain unanswered. This study provides a valuable resource for music educators. The results can help provide educators with best practices for music education. Knowledge about how children learn, as well as how they respond to music with different types of instruction (e.g. movement-no movement) can provide useful information about which teaching practices are effective in the music classroom.

This research suggests that children naturally pair music with movement, so educational methods that integrate this type of learning will build on the existing strengths
of children. Furthermore, using movement as a mnemonic device in music education will require additional research.

Further research should include a larger and more diverse sample. Participant groups with different backgrounds could be created to study specific variables extending beyond the scope of this study. For example, further study with different groups of children, with different ability levels, and with varying music experiences could be helpful in providing information about such topics as gender differences in music education, the impact of prior knowledge on song-learning, and the benefits of music education for students with a variety of disabilities. Dividing participants into specific groupings based on race, gender, ability level, or prior music knowledge could provide additional information about the differences in movement and non-movement instruction, locomotor and nonlocomotor instruction, and retention over time for different music variables. The outcomes of such research, along with effective teaching strategies, could play an integral role in improving pedagogical practice and specialized music instruction.

The current research was completed over a relatively short period of time, with an introductory song-learning session and one follow-up session a week later for each
experiment. It is recommended that future research include an analysis of music learning over a longer period of total instruction time, so that memorization, retention, and recall can be studied more thoroughly and at different time intervals. The current research studied only the short-term memory process. Additional, longer time intervals would help provide information about music and movement pairing that may help children store song information in long-term memory. Although the short time period provided this researcher with some answers to the research questions, increased time on task and multiple rehearsal sessions over a longer period of time (e.g., several months) could provide information about retrieval and long-term memory.

Future research regarding music instruction with young children should be designed in such a way that the procedure is developmentally appropriate in musical content, total research time, and duration of individual sessions. Specifically, it is recommended that researchers use shorter instructional time (15-20 minutes) for individual sessions, organize the research to include two sessions per week, and utilize simpler melodies, especially for children with no experience in singing and pitch matching. This recommendation is based on the literature which suggests that song learning research should closely
mimic a natural learning experience. Ideally, instructional time (and therefore, research time) should be short and frequent for young children.

In many cases, school music instruction occurs infrequently, happens during a limited period of time, and is the first to be cut when funding is scarce. In a typical setting, where music class meets once or twice a week, music educators do not have the luxury of rehearsing new songs over and over again. Therefore, using repetition in an experimental situation is less than practical and not easily transferable to a real setting. In order to gain the most transferable and usable data, the experimental situation should be as close to a real classroom experience as possible.

Perhaps a study that utilizes naturalistic observation, or is qualitative in nature, could provide an authentic perspective on the use of movement instruction that can be readily applied to classroom practices. Observations in this study indicated that children do use movement as a memory tool to help learn, retrieve, and recall song material. Given that the use of mental imagery is critical in a child’s learning process, the use of movement as a mnemonic in music instruction requires additional research.
Since the current research shows that prior music instruction affects children's pitch-matching accuracy (Alvarez, 1981; Apfelstadt, 1984; Boardman, 1964; Gould, 1969; Jinyoung, 2000;), it is recommended that children be exposed to some sort of music instruction prior to test procedures, so that they are at least somewhat familiar with parts of the song, song-learning procedures, rehearsal practices, and so on. This suggestion is made especially for children who have never had any type of organized music instruction in school. Prior knowledge enhances coding and storage, as well as the retrieval of information. Therefore, research that controls for prior knowledge could focus on detailed information about pitch-matching as well as text, rhythm, and melodic contour, or any other variable of interest.

Results of the current research indicate a number of factors that can affect the song learning and retrieval. In this study, the factors including time, group, method of instruction, and four specific song elements (pitch, text, rhythm and melodic contour) were studied with the intention of gathering information about the most effective practices for teaching music. The present study found that children memorize new song material through a combination of strategies that include sound and movement.
In addition to the movements that I assigned, children naturally created their own body movements to follow the beat and rhythm of songs. It could be speculated that these movements became physical and visual mnemonics that deepened and aided memorization and retention of music material. These findings show that movement significantly influenced initial learning and memorization of text and rhythm. More specifically, locomotor movement instruction affected memorization of pitch. This study also confirmed previous research (Campbell & Kassner, 2002 and Chen-Hafteck, 2002), that children memorize new song material in a specific sequence. That is, children have most difficulty with memorization of pitch and melodic contour, followed by text and rhythm. The results also suggest that the song-learning process is effective with instruction that encompasses a variety of strategies, including movement instruction.

In order to provide the most effective teaching strategies, rich learning environments, and long lasting benefits to children, music educators need to possess an arsenal of knowledge that includes developmental and cognitive characteristics of young children. Music educators should strive to create developmentally appropriate, multisensory, cross-curricular, and
cognitively challenging learning opportunities for children. The music classroom should become a place that stimulates prior knowledge about music, builds on it, and creates meaningful, relevant, and organized musical experiences for children.
APPENDIXES
January 9, 2009

Nada Martinovic-Trejgut
Music

Re: # 08-738: “The Relationship between Movement and Memorization of New Song Material in Four and Five Year Old Children”

Dear Ms. Martinovic-Trejgut:

I am pleased to inform you that the Kent State University Institutional Review Board has reviewed and approved your Application for Approval to Use Human Research Participants as Level II research through the expedited review process. This was approved on January 7, 2009. Approval is effective for a twelve-month period, January 7, 2009 through January 6, 2010.

Federal regulations and Kent State University IRB policy require that research be reviewed at intervals appropriate to the degree of risk, but not less than once per year. The IRB has determined that this protocol requires an annual review and progress report. The IRB will forward an annual review reminder notice to you by email as a courtesy. Please note that it is the responsibility of the principal investigator to be aware of the study expiration date and submit the required materials. Please submit review materials (annual review form and copy of current consent form) one month prior to the expiration date.

HHS regulations and Kent State University Institutional Review Board guidelines require that any changes in research methodology, protocol design, or principal investigator have the prior approval of the IRB before implementation and continuation of the protocol. The IRB must also be informed of any adverse events associated with the study. The IRB further requests a final report at the conclusion of the study.

Kent State University has a Federal Wide Assurance on file with the Office for Human Research Protections (OHRP); EWA Number 00001833.

If you have any questions or concerns, please contact me at 330-672-2704 or tfreder2@kent.edu.

Sincerely,

Tonya Frederick, R.N., B.S.N.
Research Compliance Administrator

Cc: Dr. Linda B. Walker
The Kent State University supports the practice of protection for human participants in research. The following information is provided so that you can decide whether you want to participate in the present study. You should be aware that, even if you agree to participate, you are free to withdraw at any time without prejudice.

My name is Nada Martinovic-Trejgut. I am a doctoral degree candidate at Kent State University, and I am interested in researching the relationship between movement instruction, acquisition, and retention of a new song material. The study will be carried out within the regular day care hours and will not interfere with your daily schedule.

Singing, just like listening and movement, is a natural part of children’s growth and development. It is part of their everyday activity. The purpose of the present study is to investigate the effect of movement during singing activity on memorization and retention of a new song material in preschool children. Deciding to take part in this project will help early childhood music educators gain a better understanding of the memory process and role of movement in recalling new information and consequently assist teachers in finding the best teaching avenues.

If you agree to participate, your students will be taught four children’s songs accompanied with various types of movements and will be asked to perform them back after the initial lesson and three days later. In order to assess children’s responses accurately, their singing will be audio-recorded. The audio-recordings will be assessed by the panel of experts who are unrelated to the subjects, in order to avoid personal bias and validate the data. All audio recordings of student’s performances will be evaluated for musical accuracy and will be held in strictest confidence.

Each teacher will be asked to give his or her consent to participate in the study – that is, (a) be present and provide support for their students during the introductory session as well as teaching process (one class per day, per
week, for the period of three weeks), and (b) assist during recording of children’s individual performances.

Taking part in this project is entirely up to you, and no one will hold it against you if you decide not to participate. Further, if you decide to participate, please know that you may stop your child participation at any time and we will not hold it against you in any way. All information will be held in the strictest confidence and will not be associated with your child’s name in any way.

Should you have any questions or concerns at any time within the scope of this research please contact Nada Martinovic-Trejgut at (440) 734-5702, nmartino@kent.edu. Your participation is solicited, but is strictly voluntary. You may withdraw from the study at any time. Your cooperation throughout this project is greatly appreciated.

Sincerely,

Nada Martinovic-Trejgut
AUTHORIZATION: I have read the above and understand the nature of this study and agree to participate. I understand that by agreeing to participate in this study I have not waived any legal or human rights. I also understand that I have the right to refuse to participate and that my right to withdraw from participation at any time during the study will be respected with no coercion or prejudice.

If I have any concern for my selection for this study or how I was treated, I will contact:

Dr. John L. West, Vice President and Dean
Division of Research and Graduate Studies
Kent State University
(Tel. 330-672-2704).

_________________________________________
Teacher’s Signature

_________________________________________
Researcher’s Signature

_________________________________________
Date
APPENDIX C
Dear Parents,

My name is Nada Martinovic-Trejgut. I am a doctoral degree candidate at Kent State University, and I am interested in researching the relationship between movement instruction, acquisition, and retention of a new song material. My research advisor, Dr. Linda B. Walker, and I are asking for parent/guardian permission for first grade students to take part in this important research.

Singing, just like listening and movement, is a natural part of children’s growth and development. It is part of their everyday activity. The purpose of the present study is to explore the effect of movement during singing activity on memorization and retention of a new song material in preschool children. We are interested in this topic because the results will assist teachers in finding the best teaching avenues. Deciding to take part in this project will help early childhood music educators gain a better understanding of the memory process and role of movement in recalling new information.

If your permission is given, your child will be taught four children’s songs accompanied with various types of movements and will be asked to perform them back after the initial lesson and three days later. In order to assess children’s responses accurately, their singing will be audio-recorded. The audio-recordings will be assessed by the panel of experts who are unrelated to the subjects, in order to avoid personal bias and validate the data. All audio recordings of student’s performances will be evaluated for musical accuracy and will be held in strictest confidence.

Taking part in this project is entirely up to you, and no one will hold it against you if you decide not to participate. Further, if you decide to participate, please know that you may stop your child participation at any time and we will not hold it against you in any way. All information will be held in the strictest confidence and will not be associated with your child’s name in any way.
Should you have any questions or concerns at any time within the scope of this research please contact Nada Martinovic-Trejgut at (440) 734-5702, nmartino@kent.edu or Dr. Linda B. Walker at (330) 672-2431, lwalker@kent.edu. If you would like to know more about this research project, I would be happy to share the results with you at the conclusion of the project.

This project has been approved by Kent State University. If you have any questions about Kent State University’s rules for research, please call Dr. John L. West, Vice President and Dean, Division of Research and Graduate Studies (Tel.330-672-2704). In addition, you will receive a copy of this consent form.

Sincerely,

Nada Martinovic-Trejgut
Consent Statement (Parent/Guardian)

Check all that apply:

_____ I agree to allow my child to take part in this research project. I know what he/she will have to do and understand that he/she may choose to stop at any time.

Parent’s Name (Print) ________________________________________________________

Child’s Name (Print) ________________________________________________________

Parent’s Signature Date
AUDIO-RECORDING CONSENT FORM

Because of the nature of research design (pre-test, post-test), I would like to audiotape children’s responses to assure the most accurate assessment. Audio-files will be held in the strictest confidence and will not be associated with your child’s name in any way. Children’s singing will be audio-recorded after the initial lesson and three days later.

I agree to audio-recording at______________ Elementary, during ____________2009,

Signature                                      Date

I have been told that I have the right to hear the audiotapes before they are used. I have decided that I:

_____want to hear the audio-files
_____do not want to hear the audio-files

Sign below if you do not want to hear the audio-files. If you want to hear the audio-files, you will be asked to sign after hearing them.

Nada Martinovic-Trejgut and other researchers approved by Kent State University may use the audio-files made of my child. The original audio-files or copies may be used for:

_____ this project   _____ teacher education

I understand that having my child be a part of the audio is totally voluntary and refusing will not affect my relationship with the teachers or the program.

Signature                                      Date
APPENDIX D
APPENDIX D

Songs for Experiment 1

Clap Your Hands Together

Children’s Traditional Song

Clap your hands together,

Give a little shake.

Make a happy circle,

Then you cut the cake.
All Around the Buttercup

Children's Traditional Song
(arranged by Ruth Boshkoff)

All a-round the but-ter-cup,

one, two, three,

If you want to play to-day,

Just choose me.
APPENDIX E
APPENDIX E

Songs for Experiment 2

Dappled Pony

Czechoslovakian Folk Melody

Come my po-ny dap-pled po-ny, Ride with me to-day.

Find a road that ne-ver ends; Find a place with all my friends

Come my po-ny dap-pled po-ny, Ride with me to-day.
Grizzly Bear

Children's Traditional Song

Grizzly bear, a griz-zy bear is sleep-ing in a cave.

Please be ve-ry qui-et, ve-ry, ve-ry qui-et,

If you wake him, if you shake him, he gets ve-ry MAD!
### APPENDIX F

**Movements for Experiment 1**

<table>
<thead>
<tr>
<th><strong>Song A</strong></th>
<th><strong>Nonlocomotor movements</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Clap your hands together</td>
<td>Clapped hands together on</td>
</tr>
<tr>
<td></td>
<td>beat</td>
</tr>
<tr>
<td>Give a little shake</td>
<td>Raised hands and shook</td>
</tr>
<tr>
<td></td>
<td>them</td>
</tr>
<tr>
<td>Make a happy circle</td>
<td>Made circles with arms in</td>
</tr>
<tr>
<td></td>
<td>the air</td>
</tr>
<tr>
<td>Then you cut the cake</td>
<td>Placed left hand flat (as</td>
</tr>
<tr>
<td></td>
<td>the cake) and made</td>
</tr>
<tr>
<td></td>
<td>repeated up and down</td>
</tr>
<tr>
<td></td>
<td>movement on beat with the</td>
</tr>
<tr>
<td></td>
<td>right hand (as the knife)</td>
</tr>
<tr>
<td></td>
<td>Made circles with arms and</td>
</tr>
<tr>
<td></td>
<td>hands</td>
</tr>
<tr>
<td></td>
<td>Counted on fingers to the</td>
</tr>
<tr>
<td></td>
<td>beat - 1, 2, 3</td>
</tr>
<tr>
<td></td>
<td>Clapped hands; mimicked</td>
</tr>
<tr>
<td></td>
<td>pat-a-cake</td>
</tr>
<tr>
<td></td>
<td>Made a “come here” motion</td>
</tr>
<tr>
<td></td>
<td>with hands, followed by</td>
</tr>
<tr>
<td></td>
<td>finger pointing to self on</td>
</tr>
<tr>
<td></td>
<td>the word “me”</td>
</tr>
</tbody>
</table>

**Song B**

- All around the buttercup
- One, two, three
- If you want to play today
- Just choose me

- Made circles with arms and hands
- Counted on fingers to the beat - 1, 2, 3
- Clapped hands; mimicked pat-a-cake
- Made a “come here” motion with hands, followed by finger pointing to self on the word “me”
APPENDIX G
## APPENDIX G

### Movements for Experiment 2

<table>
<thead>
<tr>
<th>Song C</th>
<th>Nonlocomotor Movements</th>
<th>Locomotor Movements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Come my pony, dappled pony, ride with me today</strong></td>
<td>Bent knees and made vertical circles with fisted hands in front of body (as if holding reigns)</td>
<td>Same motions as nonlocomotor while walking and bending on the beat</td>
</tr>
<tr>
<td><strong>Find a road that</strong></td>
<td>Placed left hand above eyes and turned head as if to look around; placed right hand above eyes and turned as if to look around</td>
<td>Same motions as nonlocomotor with wider movements, stretching arms and spinning whole body</td>
</tr>
<tr>
<td></td>
<td>Bent knees and made vertical circles with fisted hands in front of body (as if holding reigns)</td>
<td>Same motions as nonlocomotor while walking and bending on the beat</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Song D</th>
<th>Nonlocomotor Movements</th>
<th>Locomotor Movements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grizzly bear, a grizzly bear is sleeping in a cave</strong></td>
<td>Placed hands in air (as claws) and moved on the beat</td>
<td>Same motions as nonlocomotor with slow, heavy walking movements around the classroom</td>
</tr>
<tr>
<td></td>
<td>Placed palms together under cheek</td>
<td>Same motions as nonlocomotor while crouching</td>
</tr>
<tr>
<td></td>
<td>Placed index finger over lips</td>
<td>Same motions as nonlocomotor with slow, heavy bear-like movements</td>
</tr>
<tr>
<td></td>
<td>Clapped hands</td>
<td>around the classroom</td>
</tr>
<tr>
<td></td>
<td>Shook hands</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Placed hands in air (as claws)</td>
<td></td>
</tr>
</tbody>
</table>
REFERENCES


*Psychology of Music, 6*, 3-20.


Young, L. P. (1982). An investigation of young children’s music concept development using nonverbal and


