AN INVESTIGATION OF THE RHYTHM APTITUDE
AND RHYTHM ACHIEVEMENT OF
FIRST, SECOND, AND THIRD GRADE STUDENTS

by

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A thesis submitted to the Faculty of the University of Delaware
in partial fulfillment of the requirements for the degree of Master of Music

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ABSTRACT

The purpose of this study was to examine the effect of an audiation-based curriculum on rhythmic music aptitude and rhythm achievement of elementary school students. Specific research questions addressed in this study were (a) Is there a relationship between developmental rhythm music aptitude and rhythm achievement of first, second, and third grade students? (b) Does the relationship between rhythm music aptitude and rhythm achievement change with age? and, (c) Does age have an effect on rhythm achievement?

Participants in this study (N = 183) were in grades one through three, from 10 intact homerooms. Students attended a general music class once a week for 45 minutes. The study lasted for five months. All participants engaged in 5 to 10 minutes of formal rhythm pattern instruction, which alternated between duple and triple meter patterns, each week. Improvisation activities were included in the lessons.

At the end of the study, all participants took an oral improvisation test in duple and triple meters. Two independent judges scored each improvisation using a 5-point continuous rating scale. All participants also took a paper and pencil meter-labeling test. Gordon’s Primary Measures of Music Audiation (PMMA) (PMMA, 1986) was administered as a posttest.
The results of this study revealed that there was no relationship between rhythm music aptitude and rhythm achievement. Age had an effect on achievement for aural identification of triple meter. The inclusion of audiation-based techniques, such as rhythm pattern instruction, may improve students’ rhythmic music achievement.
Chapter 1

REVIEW OF LITERATURE

Audiation is a critical element in the development of musical competency (Gordon, 2000). Edwin Gordon coined the term audiation, which states that when audiation occurs, “...we assimilate and comprehend in our minds music that we have just heard performed or have heard performed sometime in the past” (2003, p. 4). Through the body and the ear, a person’s brain translates what she hears and processes the information to give musical meaning. In a similar way, musical development and language development are parallel processes and the primary way of understanding both is by listening. When a person listens to speech, she is giving meaning to words by recalling and making connections from past listening experiences (Gordon, 2003). A person’s brain also anticipates what might come to mind next. Like language, when a person listens to music, she gives meaning to what was heard based on past music listening experiences, and as with language, she will recall music heard in the past and make musical predictions of what may be heard in the future.

Music Aptitude

Music aptitude is the potential to achieve in music, which supports the need for developing the ability to audiate. According to Gordon (2003), everyone has the potential to achieve in music. Some researchers agree that the first year of life is
the best time for accelerated learning (Hyun, 2000). During the first few years of life, the brain is most vulnerable to environmental stimuli (Shore, 1997). The critical years for learning are from age zero to ten (Shore, 1997). If the environment is rich with available knowledge and learning, the brain will develop to its full capacity. Through stimulation, the brain develops neurological connections. Without stimulation, the brain may start to lose information by discarding unused neurological connections in the form of synaptic pruning (Gopnic, Meltzoff, & Kuhl, 1999). Synaptic pruning eliminates weaker, unused connections and strengthens frequently used connections. This is why it is important to expose young students to a variety of life experiences.

A person’s ability to make musical meaning may not come from any one area of the brain (Weinberger, 2004). When processing higher musical functions, Beisteiner, Altenmuller, Lang, Lindinger, and Deecke (1994) found that both halves of the brain were in use. The cognitive function appears fully developed by about age nine with no further change even in old age (Spearman, 1904). However, recent investigations show that the availability of learning is possible and continues throughout an individual’s life (Partridge, 2009).

Brain development is an extensive progression in which adults can create new neurons in their brain, managing memory and higher order cognitive functions. Yet, in relationship to music, a child’s music aptitude can change depending on the quality of music instruction she receives (Gordon, 2003). This period from pre-birth through age nine is the developmental music aptitude stage. Around age nine, music
aptitude stabilizes, meaning that the environment no longer has an impact on music aptitude development. This does not mean that a person can no longer increase her music achievement. Brain plasticity allows a person the capability to continue to learn music. Music achievement may increase throughout a person’s lifetime with the aid of proper instruction and learning environment.

**Music Achievement**

Music aptitude is not to be confused with musical achievement (Gordon, 2003). There are many types of musical achievement such as (a) tonal, (b) rhythmic, (c) movement, and (d) improvisational. Achievement is the outcome from what one has been exposed to and has learned; therefore, the level of instruction influences the result of a person’s achievement. Students with an elevated level of music achievement also have a high music aptitude (Gordon, 2003). On the other hand, if a student has a low level of achievement, it does not mean that her aptitude is low. A music aptitude test acts as an objective aid to teachers and parents. Providing the child with appropriate musical opportunities and instruction helps her to make the best use of her music aptitude (Gordon, 1986b). An aptitude test helps a teacher to evaluate the proper instruction needed to meet a child’s individual music needs.

Rating scales or multiple-choice tests are also instructional assessments that help a teacher to measure musical achievement (Gordon, 2003). However, a reliable and valid music aptitude test is the best way to differentiate between music achievement and the potential to achieve musically. The following section will
examine a number of studies that focus on music aptitude and achievement-based research.

Music Aptitude and Achievement-Based Research

A number of research studies have focused on music aptitude and music achievement. These studies have concentrated on (a) musical aptitude and improvisation (Azzara, 1993; Brophy, 2005; Guilbault, 2004; Reinhardt, 1990; Schmidt & Sinor, 1986; Velez, 2009), (b) rhythm achievement (Bennett, 1991; Colley, 1987; Gardner, 1971; Groves, 1969; Jones, 1976, 1992; Persellin, 1992; Rainbow, 1981; Shehan, 1987; Wolf, 2004), (c) tonal aptitude and tonal achievement (Atterbury & Silcox, 1993; Gault, 2002; Hornbach & Taggart, 2005; Mota, 1997; Phillips & Aitchison, 1997; Phillips, Aitchison, & Nompula, 2002; Rutkowski, 1996; Rutkowski & Miller, 2003), and (d) rhythm aptitude and rhythm achievement (Palmer, 1976; Schleuter & Schleuter, 1989). A survey of the literature revealed that, upon considering music aptitude and music achievement, it is more common to find tonal, melodic, and rhythm achievement studies that do not incorporate verbal responses, rather than aptitude or rhythmic achievement studies that require a verbal response for assessment.

Musical Aptitude and Improvisation

Researchers have focused on the importance of musical creativity and improvisation among elementary students (Azzara, 1993; Brophy, 2005; Schmidt &
Improvisation is a spontaneous reaction to creating music within certain guidelines (Azzara, 1993) and, as part of the National Standards for Arts Education (Consortium, 1994), is an important element of a music curriculum. The ultimate goal for music teachers should be to provide students with the skills and opportunity to create and improvise their own music, increasing the students’ ability to be an independent musician (Azzara, 1993; Gordon, 2003).

In a study on audiation-based instrumental improvisation with 66 fifth grade students, Azzara (1993) concluded that students who received improvisation instruction reached a higher musical achievement level than those students who did not receive improvisation instruction. Azzara further concluded that, when improvisation was included as a part of music instruction, students acquired “...opportunities to develop an increased understanding of harmonic progression through the mental practice and physical performance of tonal patterns and rhythm patterns” (1993, p. 339), thus giving purpose and meaning to the music they played. Incidentally, those students with high aptitude scores also scored high on performance achievement tasks.

In a similar study with 62 students from age seven to nine, Brophy (2005) noticed a significant change between the ages of eight and nine in the students’ level of improvisational achievement when playing an Orff xylophone. There was more control with steady beat, an increased number and variety of rhythm patterns, rhythmic motives, and phrased melodies. Gordon’s Intermediate Measures of Music
Audiation (IMMA) (IMMA, 1986a) revealed a significant relationship between music aptitude and melodic phrasing. Brophy (2005) stated that, “…the observed changes seemed to be developmental in nature” (p. 122).

Schmidt and Sinor (1986) investigated the relationship between audiation and a dimension of cognitive style called reflection/impulsivity with 43 second grade students. In their study, reflection referred to responders who take their time when selecting an answer or response. Impulsivity refers to individuals who “…select and report solutions quickly, with minimal consideration for their probable accuracy” (p. 161). Students responded to musical tasks; using piano, voice, and temple blocks. Schmidt and Sinor’s investigation resulted in a significant relationship between reflection/impulsivity and Gordon’s Primary Measures of Music Audation (PMMA) (PMMA, 1986b) tonal subtest, and no significant difference between reflection/impulsivity and PMMA rhythm subtest.

**Rhythmic Elements in Improvisation**

In a longitudinal descriptive study, Moorhead and Pond (1978) affirmed that instrumental improvisation is a natural musical behavior for children ages three, four, and five. According to a study by Reinhardt (1990), the use of different durations and rhythm patterns in improvisation using an Orff xylophone strengthened as age increased among three, four, and five-year-olds. One-hundred and five children improvised a song on an Orff xylophone and were evaluated for the use of steady beat,
meter, different durations of notes, and rhythm patterns. Results suggested that the ability to maintain a steady beat and sense of meter stabilizes by age three (1990).

**Tonal Improvisation**

Some researchers believe that tonal improvisation is a valuable skill and have devoted their study to vocal or tonal improvisation (Guilbault, 2004; Velez, 2009).

In a research study, examining the effect of harmonic accompaniment on tonal achievement and tonal improvisation on 136 Kindergarten and first grade students, Guilbault (2004) concluded that root melody accompaniment had no effect on tonal achievement. She did, however, discover that children who received instruction with root melody accompaniment were more successful at improvising melodies with harmonic function, a sense of tonality, and the ability to maintain a tonal center compared to those students who did not have such instruction.

Velez (2009) studied the relationship of tonal music aptitude, vocal improvisation, and the inclusion of tonal pattern instruction on 182 first and second grade students. Her conclusions demonstrated that no relationship exists between the ability to improvise vocally and developmental tonal music aptitude. She found a significant difference between the control and experimental groups in regard to vocal improvisation achievement. Those students that received tonal pattern instruction were
more successful at vocally improvising compared to students who did not receive
tonal pattern instruction.

**Summary**

All of the researchers mentioned in the improvisation section of the review of literature agreed that improvisation was an important component in a music curriculum. None of the studies in this section addressed audiation-based rhythm pattern instruction for achievement in oral rhythm and improvisation. There exists a wide variety of possibilities for assessing rhythm achievement, which the next section will examine.

**Rhythm Achievement**

There are an array of methods and styles for teaching rhythmic concepts to students. Rhythm achievement in music has been examined from the perspective of how students develop an understanding of (a) rhythmic reading (Shehan, 1987; Colley, 1987), (b) sense of meter (Jones, 1976, 1992), (c) beat competency (Groves, 1969; Rainbow, 1981), and (d) comprehending rhythm patterns (Bennett, 1991; Persellin, 1992; Gardner, 1971; Wolf, 2004). Researchers have attempted to define the most effective avenue for teaching rhythmic competency.

**Rhythm reading.** In a study examining the effects of short-term retention with rhythm reading through four modes of aural and visual representation, Shehan
(1987) found that second and sixth grade students (N = 49) have the most success learning rhythm patterns through combined visual and aural modalities.

Colley (1987) examined three different rhythmic methods to determine their effectiveness on rhythm reading with second and third grade students (N = 160). The three methods used were Gordon beat function syllables, Kodály syllables, and the mnemonic word method. Results showed a significant difference between the control and treatment groups. Both the word and Gordon methods were significantly more effective than the Kodály method.

**Meter.** In a study of 66 nine and one-half-year-old students, Jones (1976) found that only one-third were able to pass a meter concept task. The task involved identifying the basic meter of 12 different items despite the rhythm pattern used. In an earlier study, Jones (1992) found that meter comprises both physical and psychological time. The researcher studied whether students in third, fourth, and fifth grade (N = 108) could more easily identify and perceive meter in music when using conducting motions compared to using a verbal response. The results showed that there was a significant difference in both fourth and fifth grade achievement between the Verbal Motor Response group (VMR), in which students used conducting motions, and the Verbal Response group (VR), without conducting motions. The VMR group scored significantly higher than the VR group, suggesting that movement aided the students’ rhythmic achievement.
**Rhythmic tasks.** Incorporating movement, such as synchronization (Groves, 1969) and clapping or marching (Rainbow, 1981) for rhythmic success, are aspects of rhythmic achievement that interest researchers. The importance of developing motor-rhythmic responses in children has increased over the years and researchers have studied the role of movement to determine if it relates to understanding rhythmic concepts (Weikart, 1987).

In Groves’ (1969) study, the experimental group received pattern instruction in a non-directive manner with an emphasis on rhythmic stimuli within a tonal setting (N = 131). Groves found that first, second, and third grade students’ ability to synchronize body movements with rhythmic stimuli did not enhance with formal training.

In a three year study of the rhythmic abilities of young children, Rainbow’s (1981) findings indicated that certain motor skills in three and four-year-olds (N = 150) as compared to older children might not be developed, therefore creating an unreliable assessment of steady beat. Similar to Rainbow, Gordon (2000) determined that rhythm achievement and developmentally appropriate movement go hand in hand.

**Rhythm patterns.** Bennett’s (1991) investigation on pattern perception, accuracy, and response mode preference entailed discovering the most accurate way for children to demonstrate patterns from a melodic framework. Eighteen students from Kindergarten, second grade, and fourth grade responded to melodic patterns
through chinning, tapping, and dotting\textsuperscript{1}. Results showed that there were no significant differences between age and the frequency of students’ perceptions of four-beat melodic patterns. However, there were significant differences within each age group between the frequencies of students’ perceptions of four-beat melodic patterns compared to the length of patterns (1991). As age increased, perception accuracy increased. Bennett concluded by suggesting, “…children may hear patterns that do not necessarily match the visual, metric organization of written notation” (1991, p. 84). Bennett also noted that due to the use of a very small sample size, the study “…may have introduced biases, thereby limiting the generalizability of the findings” (p. 75).

In a similar study investigating response mode preferences, Persellin (1992) examined first, third, and fifth grade students (N = 210) on their ability to remember rhythm patterns using visual, auditory, and kinesthetic, or a combination of modes. Grade level was significant ($p < .001$) for the overall mean scores of pattern achievement. The best combination for first graders was visual and kinesthetic. The best combination for third graders was involving all three: visual, auditory, and kinesthetic. The best combination for fifth graders was auditory and kinesthetic. Persellin concluded that, as age increased, performance accuracy increased, and students were more successful at completing motor-rhythmic responses.

\textsuperscript{1} Chinning is singing a song using a neutral syllable. Tapping involves performing rhythm from a melody by tapping a finger on the palm of a hand. Dotting allows the responder to notate the rhythm pattern across a piece of paper with a marker.
Gardner (1971) noticed that there were many methods to teach rhythm and investigated the duplication of rhythm patterns as a way to assess rhythmic skills. Sixty students from first, third, and sixth grade duplicated 20 tapped rhythm patterns from a recording by hitting a pencil against a hard surface. Judges classified answers as correct or incorrect. There were significant differences between age groups, the number of taps within each pattern groups, and individual students. Mean scores increased with grade level. The six-tap items were the hardest patterns for every grade. Gardner (1971) concluded that longer patterns were more difficult to duplicate, and the number of taps within a rhythmic pattern did not indicate whether the item was easier or harder than another.

Many years later, Wolf (2004) researched a similar idea, except that students responded verbally to the rhythm patterns. The researcher-constructed test, Rhythm Pattern Performance Test (RPT) (RPT, 2002) was used to examine students’ ability to verbally duplicate rhythm patterns. She believed that children needed a musical vocabulary through performing and listening before they could learn to read music (2004), which compliments Gordon’s learning hierarchy in his music learning theory. One-hundred and sixty-five Kindergarten students participated in the study. Results showed that duple meter patterns that were chanted were more accurate than chanted triple meter patterns. Triple meter patterns totaled 83% of the patterns Wolf labeled as difficult.
Summary

Of all of the rhythm achievement studies consulted for the present review of literature, there was no study found that investigated students’ rhythm music aptitude. Research on rhythm aptitude and rhythm achievement is lacking. There are rhythm aptitude tests available, yet researchers do not seem to be interested in exploring the avenue of rhythm aptitude and rhythm achievement. Studies tend to focus on visual, audio, or reading methods for rhythm without addressing the nature and development of rhythmic audiation. Gordon posits in his music learning theory that students should first learn to listen, perform (chant), audiate, then read, and notate music (2003). Researchers have not challenged this concept enough to support or discourage it. There is an abundant amount of tonal aptitude and tonal achievement studies, which have explored different avenues for student tonal and singing success. These studies may have applications for the investigation of rhythm audiation and achievement. The next section will address this topic.

Tonal Aptitude and Tonal Achievement

Researchers have found that tonal music aptitude does not directly influence singing achievement (Atterbury & Silcox, 1993; Hornbach & Taggart, 2005; Mota, 1997; Phillips & Aitchison, 1997; Phillips, Aitchison, & Nompula, 2002; Rutkowski, 1996; Rutkowski & Miller, 2003). Research on tonal aptitude and/or tonal achievement has primarily focused upon the effectiveness of (a) individual or small group activities (Rutkowski, 1996), (b) teacher feedback and modeling (Rutkowski &
Miller, 2003), (c) singing accuracy and vocal range (Phillips, Aitchison, & Nompula, 2002;), (d) pitch discrimination (Phillips & Aitchison, 1997), (e) harmonic accompaniment (Atterbury & Silcox, 1993), (f) musical tasks (Mota, 1997), (g) the presence or absence of text (Gault, 2002), and (h) singing achievement (Hornbach & Taggart, 2005).

**Individual or small group singing achievement and teacher feedback.**

Rutkowski (1996) conducted several studies to determine if individual or small group singing activities had an effect on singing voice and developmental music aptitude. Using Kindergarten students (N = 99), the results showed a significant effect for individual and small group settings and singing achievement. The treatment group earned higher singing achievement scores compared to the control group. There was no significant correlation on developmental tonal music aptitude with the inclusion of individual or small group singing.

Rutkowski and Miller (2003) conducted multiple investigations over a span of time and discovered a consistent trend that singing achievement improved when individual or small group singing was part of a music program. During an investigation on teacher feedback and modeling on 38 first grade students’ singing voice development and developmental music aptitude, Rutkowski and Miller found no statistically significant effect on the students’ use of singing voice or developmental tonal music aptitude, compared to the treatment and control group. The treatment group received detailed feedback and teacher modeling, and the control group
received basic feedback. Although the differences were not statistically significant, there was a greater improvement of singing achievement with the treatment group compared to the control group (Rutkowski & Miller, 2003). Rutkowski and Miller concluded that there was a need to conduct the same study again with a larger sample size.

**Singing accuracy and pitch discrimination.** Phillips, Aitchison, and Nompula (2002) found no significant difference between music aptitude and singing achievement. This conclusion suggests that among fifth grade students (N = 74), inaccurate singers may be able to decipher pitch mentally, but are unable to produce a correct melodic answer vocally. A similar conclusion occurred when 79 third grade students participated in a pitch discrimination and tonal aptitude study (Phillips & Aitchison, 1997). Even if the inaccurate singer could not orally produce a correct response, it did not mean that the student could not aurally comprehend the pitch. Interestingly, there was a significant difference in tonal aptitude as measured by PMMA (Gordon, 1986b) between accurate and inaccurate singers, but no significance between pitch discrimination as found through Colwell’s Music Achievement Test (MAT) (MAT, 1969) when comparing accurate and inaccurate singers.

**Harmonic accompaniment.** Some researchers are interested in determining if harmonic accompaniment influences singing achievement. Atterbury and Silcox (1993) investigated 205 Kindergarten students’ singing achievement to determine if there was a significant difference between students that received piano
harmonic accompaniment (experimental group) during singing instruction, and students who did not receive any piano harmonic accompaniment (control group). All students received Gordon’s PMMA (1986b) test during the fall and again in the spring to determine if there was a significant change in music aptitude between the treatment and control group after a year of instruction. No significant differences existed between the PMMA composite scores and the experimental and control group. There was also no significant difference between the experimental and control group’s singing achievement. The researchers recommended that more studies should be conducted to investigate the aspect of accompaniment and singing achievement among Kindergarten, first, and second grade students.

**Musical tasks.** Mota (1997) used 104 children who were age six, from three different schools in Portugal to study musical development and musical aptitude, home environment, and instruction. She questioned if music aptitude tests could show the full potential and range of a student’s musical ability. The study lasted three full school years. The participants were administered the PMMA (Gordon, 1986b) tonal and rhythm subtests and were asked to perform three different musical tasks prior to formal music instruction: singing, reproducing a short song, and keeping meter while playing along with a recorded rhythm. A six-point categorical scale was used to score the musical tasks. Categories ranged from *exact replication* to *nothing*. Correlations were performed between the PMMA scores and the scores on singing accuracy, duplicating a tune, and maintaining meter. Mota concluded no significant relationship
between tonal aptitude and tonal achievement on activities such as singing a song in tune. She believed that current music aptitude tests serve partial purposes and may be unjust towards the many ways that children can express musical behaviors (1997).

**Presence or absence of text.** In a study of 112 Kindergarten and first grade students, Gault (2002) examined the effect of music achievement with whole song versus phrase-by-phrase method, text versus no text, and developmental music aptitude. The researcher’s results varied depending on the chosen song learned by the students. Statistically significant interactions in the presence of text condition and echo-phrase pedagogical procedure were found for the first song, but not in the second song. PMMA (Gordon, 1986b) and text condition produced a significant main effect. Gault concluded that the effectiveness of text versus no text and whole song versus phrase-by-phrase method depended on the song learned.

**Singing achievement.** Hornbach and Taggart (2005) studied the relationship between singing voice and tonal music aptitude with 162 Kindergarten, first, second, and third grade students. Results showed no meaningful relationship between singing achievement and tonal aptitude as measured by PMMA (Gordon, 1986b). Hornbach and Taggart concluded that singing voice and tonal aptitude are separate concepts, and that singing achievement may improve when singing is part of music instruction. Interestingly, second grade students displayed higher singing achievement than did Kindergarten and first grade students. Hornbach and Taggart concluded that “singing achievement may be, in part, developmental” (2005, p. 327).
Summary

The research presented in the review of literature for tonal music aptitude and tonal achievement consistently concluded that there is no significant relationship between singing achievement and developmental tonal music aptitude. Many of the researchers noted that singing achievement improved when singing or specialized singing methods were part of the music instruction. Each concluded that more research is needed in the area of singing achievement and developmental tonal music aptitude.

Even though there is a rich amount of tonal aptitude and tonal achievement studies, there is a limited amount of rhythm aptitude and rhythm achievement studies. The next section will present studies based on the importance of rhythm aptitude and rhythm achievement.

Rhythm Aptitude and Rhythm Achievement

Very few studies have been conducted on rhythm aptitude and rhythm achievement, in terms of rhythm reading (Palmer, 1976) and rhythmic tasks such as stomping, clapping, and chanting (Schleuter & Schleuter, 1989) in order to discern the most effective method for teaching rhythm achievement and comprehension to students.

Rhythm reading. Palmer (1976) sought to compare the effectiveness of two different methods of rhythm reading instruction. Richards’ Threshold to Music (1971) and Gordon’s The Psychology of Music Teaching (1971) were the basis of the
researcher’s instruction. Palmer used three groups of fourth grade students (N = 136). One group received rhythm reading instruction developed by Richards (1971), based on the Kodály system (n = 48), one group (n = 50) was taught a method of rhythmic literacy created by Gordon (1971), “…whose approach to rhythmic literacy is an outgrowth of his interest in the measurement of musical aptitude and achievement” (Palmer, 1976, p. 110), and the third was the control group (n = 38), which received no special instruction. Gordon’s Musical Aptitude Profile (MAP) (MAP, 1988) was administered as a pretest to all participants. Pre- and posttests were given to all students in written and performance achievement in rhythm reading. Results showed a high correlation between the MAP scores and the written rhythm reading achievement posttest scores. There was a significant difference in achievement between the control group and the groups that received special instruction in rhythm reading. The experimental groups were more successful at the written and performance achievement tasks compared to the control group. Palmer concluded that written and performance achievements are separate constructs in rhythm reading achievement.

**Rhythmic task.** Schleuter and Schleuter (1989) examined rhythm response tasks, using the researcher constructed Rhythm Response Test (RRT) (RRT, 1984) and Gordon’s PMMA (1986b) among Kindergarten, first, second, and third grade students. The rhythm response tasks included the use of clapping, chanting, and stepping. PMMA was used to test the students’ developmental music aptitude. An analysis of covariance (ANCOVA) aided in determining if there was a relationship
between music aptitude and rhythm achievement in the areas of music training, grade level, and sex. School One (n = 103) received general music instruction twice a week. School Two (n = 96) received no formal music instruction, but participated in singing activities once a week. Results revealed significant main effects for RRT scores and grade level in both schools. As grade level increased, the responses, in general, were more correct. Stepping was the most difficult task in both schools. Chanting was the most successful task for School One, where clapping was the most successful task, except for Kindergarten, in School Two. There was a significant relationship between fall and spring PMMA scores in all three grades, but not between schools. They believed this was due to maturation and informal music learning, not music training.

**Summary**

Based on the literature reviewed, researchers have found that incorporating a variety of methods or techniques of presenting musical skills such as rhythm or tonal concepts to students can help them successfully respond to music — whether it be through improvisation, visual and audio modalities, kinesthetic, or aural/oral methods. However, the idea of using audiation-based rhythm pattern instruction to develop rhythmic achievement through improvisation with students is lacking in the research. By examining this method as an aid in rhythmic competency, it is possible that music educators will find a more comprehensive method of teaching rhythmic concepts and skills.
Purpose and Problems of the Study

Researchers have studied the effectiveness of different ways that students learn meter, and rhythmic concepts and skills. The studies have focused on the use of oral, audio, visual, and motor skills for rhythmic development. The conclusions from these studies do not show a consistent outcome. All of the studies overlooked the interplay of audiation and rhythmic comprehension while investigating the rhythmic competency of children in the general music classroom. Not enough research has transpired to support a strong method for teaching rhythmic and metrical concepts. Missing from the literature is research on rhythm aptitude and the use of audiation-based rhythm pattern instruction as a means for developing rhythmically competent students. Therefore, with the intent of improving pedagogy for rhythm achievement, the purpose of this study was to examine the effect of an audiation-based curriculum on rhythmic music aptitude and rhythm achievement of elementary school students. Specific research questions addressed in this study were as follows:

1. Is there a relationship between developmental rhythm music aptitude as measured by Primary Measures of Music Audiation (PMMA) (Gordon, 1986b) and rhythm achievement of first, second, and third grade students?

2. Does the relationship between developmental rhythm music aptitude and rhythm achievement change with age?
3. Does age have an effect on rhythm achievement?

A review of related literature revealed that a number of researchers investigated tonal and rhythm music aptitude and achievement in the areas of movement, clapping or tapping, pattern instruction, improvisation, chanting, and singing. In the next chapter, research related to the purpose and problems of the present study will be presented to form a backdrop for the ensuing methodology.
Chapter 2

REVIEW OF RELATED LITERATURE

The purpose of this study is to determine the relationship between the developmental rhythm music aptitude and rhythm achievement of first, second, and third grade students who engage in a curriculum that focuses on rhythm pattern instruction. The literature most closely related to the present study is classified in the following categories: (a) rhythm achievement, (b) rhythm aptitude and rhythm achievement, and (c) tonal aptitude and tonal achievement.

Rhythm Achievement

A number of studies have focused on students’ proficiency to demonstrate rhythmic abilities. A deeper examination in this section will look into notational reading, motor skills, pattern instruction, and improvisation; however, not all of the studies incorporated audialional instruction methods, particularly an investigation into students’ rhythm music aptitude, which the present study will incorporate.

Rhythm reading. Shehan (1987) examined the outcomes of audio and visual ways of reading rhythm and short-term retention. Second grade \((n = 25)\) and sixth grade \((n = 24)\) students from a parochial school in the suburban Midwest were used for the study. All of the subjects lacked exposure to a systematic course of
rhythm reading and all had minimal note-reading skills. The researcher used four patterns in duple meter consisting of eight beats as a basis for the study and a mnemonic syllable system taught for Japanese theatre drums, which she viewed as a practical approach to rhythm pattern instruction for this particular setting. Four modes of presenting the rhythm patterns were used and tested: (a) audio-rhythm mode (sounded on a woodblock), (b) audio-mnemonics mode, (c) audio-visual rhythm mode (written out and sounded on a woodblock), and (d) audio-visual-mnemonics mode. Subjects were individually tested and a tape-recorded performance of each rhythm pattern was used in order to ensure consistency. The subjects’ task was to memorize and perform each pattern on a woodblock following the performance of the given pattern.

A four-way analysis of variance (ANOVA) was used to analyze the results. “Neither order of presentation nor rhythm patterns was significant” (Shehan, 1987, p. 122). Modes of presentation and grade levels were found to be significant at the $p = .0001$ level. A Neuman-Keuls multiple comparison showed that the audio modes were significantly different from one another and from the visual modes. This revealed that a greater number of performances were necessary in learning audio presented rhythm patterns. The use of mnemonics decreased the number of needed performances in both the audio and visual modes. Statistical significance was only apparent between the audio-rhythm and audio-mnemonics modes. In addition, there was a significant difference between grade levels. Second grade students needed more
than twice the number of performances than sixth grade students at mastering a rhythm pattern.

Results from this study indicate that the use of audio and visual modes may assist in the learning of rhythm patterns. Using both modes simultaneously may also improve the learning retention of rhythms and it was clear that age was a factor in how quickly one can learn, retain, and perform a pattern. While Shehan’s (1987) study used Japanese theatre drum syllables for the rhythm pattern instruction, the current study will use rhythm syllables designed by Gordon (2001a). Shehan (1987) incorporated a visual mode of pattern instruction and had the students perform the required patterns on a woodblock when mnemonics did not occur during the final assessment. There was only an assessment of duple meter. The present study only focuses on aural modes of presentation and students perform the final assessment orally, using neutral syllables. In addition, the current study investigates and assesses both duple and triple meter. The current study will look at age as a factor for rhythm achievement, which is similar to Shehan’s (1987) research. However, the current study will also investigate age and the relationship between developmental rhythm music aptitude and rhythm achievement.

**Rhythmic tasks.** Rhythm has its foundation in movement (Gordon, 2000). There are a variety of words researchers and musicians use to explain musical movement. Dalcroze referred to movement as energy, tension, or plasticity (Gordon, 2003). Laban used the words time, space, weight, and flow to explain movement
Researchers have explored the idea of rhythmic development with a connection to movement as labeled in its many forms and its relationship to rhythmic achievement.

A study conducted by Groves (1969) compared 131 first, second, and third grade students' achievement in motor-rhythmic skills. Half of the children received training and the other half was a control group. Pretests created by Groves determined preliminary rhythmic-synchronization abilities. Six rhythm patterns made up the tests. In order to validate that the two tests were equal, a tape-recorded version of the initial and final rhythm pattern examples were used, including expert opinions from the judges. A 4-point scale was used to rate the children’s performances, and independent judges scored the tests. A number of tests, including a questionnaire determined other factors such as motor ability and home musical background. The following tests were included in Groves’ study: Brace Scale of Motor Ability (Vickers, 1942), Warner’s Index of Status Characteristics (Muker & Warner, 1949), Stanford Achievement Test (Kelly & Madden, 1964), California Short Form Test of Mental Maturity (Clark, Sullivan, & Tiegs, 1957), and the California Test of Personality (Clark, Thorpe, & Tiegs, 1953). The experiment lasted 24 weeks during the 1964-1965 school year. Conclusions resulted with no significant differences in the capability to coordinate body movements with rhythmic stimuli between students who received the extra rhythmic training and those that did not. However, there was a
significant difference between students’ levels of ability to use motor skills successfully in order to be able to synchronize movement with rhythmic stimuli.

Rainbow (1981) researched three- and four-year-olds to determine their ability to learn specific rhythmic tasks. Fourteen tasks were used which included such activities as clapping, tapping, marching, and verbally speaking rhythm patterns. Students in this longitudinal study (N = 154) were investigated over a three year span. A 5-point scale was used to show how successful each student was in completing the motor-rhythmic and verbal rhythm pattern tasks. Children were evaluated on specific rhythmic tasks, such as keeping a steady beat, clapping, marching, speaking words in rhythm, and duplicating a rhythm pattern, which the music teacher clapped. Three judges rated the students. Results of the study demonstrated that more students were successful at the verbal responses to rhythm than motor responses such as marching. Rainbow indicated that certain motor skills do not develop in three- and four-year-olds. More research needs to be in this area of study.

**Summary.** Conclusions from the two studies suggest that age is a factor when combining movement to rhythmic tasks and activities. In addition, students are more likely to succeed when more than one type of learning style is incorporated. None of the researchers looked at Gordon’s method for teaching rhythm patterns to children of varying age, which involves the vocalization of rhythm patterns. The above studies used discrete movements for teaching rhythmic competency. If the researchers incorporated the use of continuous flow or fluid movement to encourage a
better understanding of feeling rhythm and meter through time and space and the vocalization of rhythm patterns, their achievement outcomes may have been different. The current study’s curriculum will incorporate movement such as continuous flow and self-space exploration in almost every lesson taught.

**Pattern instruction.** Persellin (1992) examined the effects of visual, auditory, and kinesthetic modalities on the presentation of rhythm patterns to students. Individual and combinations of modalities were used in the study. First (n = 70), third (n = 70), and fifth (n = 70) graders from two different elementary schools were asked to memorize and perform six different rhythm patterns which increased in difficulty. A 10-point scale (Persellin, 1992) created a maximum possibility of 60 points earned. Validity of the testing process was determined by an outside observer who was an elementary music educator. Grade level was significant ($p < .001$) for overall mean scores. Out of the possible 60 points, mean scores for each grade increased with age: first grade, $m = 23.0$; second grade, $m = 37.9$; fifth grade, $m = 46.8$. The researcher concluded that children were more successful at the rhythm patterns when there was an incorporation of more than one modality. The best combination for first graders was visual and kinesthetic. The best combination for third graders was involving all three: visual, auditory, and kinesthetic. The best combination for fifth graders was auditory and kinesthetic. Persellin’s findings encouraged teachers to use multiple learning modalities in their teaching in order to maximize student learning and success. Persellin did not use vocalization as one of the choices for modalities. This
characteristic does not correspond with the present study. Gordon’s Learning Sequence Activities (LSAs) (LSAs, 2001a & 2001b) focus on the idea of chanting the patterns. The lessons that accompany the pattern instruction encourage visual, auditory, kinesthetic and vocalization.

Gardner (1971) investigated students’ ability to duplicate rhythm patterns. Sixty first, third, and sixth grade students from a middle-class population participated in the study. Students listened to a recording of a person tapping a pattern. Once the pattern was complete, the student immediately duplicated the pattern using a pencil. Twenty items made up the test, which included patterns using four, five, six, seven, and eight taps all with different durations and rests. Judges labeled responses as correct or incorrect. An analysis of variance (ANOVA) confirmed a significant difference ($p < .01$) between age groups, item groups, and individual participants. Shorter patterns were easier to duplicate than longer patterns. Most students were more successful at correctly duplicating patterns in the second half of the test. Gardner (1971) noted that depending on what kind of pattern was used and where it was within the sequence affected the student’s ability to duplicate the pattern. He recommended incorporating a variety of ways to respond to rhythm patterns to appeal to all levels of student learning.

The use of pattern instruction relates to the current study. What differs are the presentation of the patterns and the use of a music aptitude test. The current investigation will incorporate oral responses, which are linked to formal pattern
instruction used during the beginning of every lesson. Students will also engage in fluid and rhythmic movement in order to kinesthetically connect audiation of the patterns to the body within the activities. There was no mention of such activities in Gardner’s investigation.

Many years later, Wolf (2004) investigated Kindergarten students’ (N = 165) ability to orally duplicate rhythm patterns. Six middle-class suburban elementary schools from two school districts participated. The purpose was to develop a hierarchy of rhythm patterns to help advance understanding of children’s musical abilities (Wolf, 2004). Wolf compiled the most common patterns used among three standard method books to create a Rhythm Pattern Performance Test (RPT) (RPT, 2002). The test consisted of duple and triple meter patterns ranging in three different identified levels: (a) easy, (b) moderate, and (c) difficult. A woman’s pre-recorded voice chanted the patterns on a neutral syllable, bah. A metronome tapped the macrobeat for each pattern. The RPT was a 6-point scale which was used to rate the students’ oral responses in order to accurately score the varied responses. Students took the test individually during the spring semester. Interjudge reliability was high (r = .93). Results from the rhythm pattern hierarchy showed that more patterns chanted in duple meter received a correct score compared to patterns chanted in triple meter. Triple meter patterns totaled 83% of the patterns labeled as difficult. Wolf (2004) concluded that an echo response “…should be followed, presenting patterns in an imitative game format to develop successful and enjoyable experiences in music-making” (p. 9).
Further, having a hierarchy of patterns from the easiest to most difficult allows for differentiation among skill levels. Wolf implied that there was a need for more songs and activities in triple meter. Wolf’s method of research relates to the current study, since her subjects orally chanted responses instead of using physical motions like tapping or clapping.

**Rhythm improvisation.** Reinhardt (1990) investigated 105 three-, four-, and five-year-olds’ improvisational skills on an Orff xylophone. Three different schools from the Cleveland, Ohio area participated in the study. School One students received two 30-minute music classes a week. School Two students received one 30-minute music class a week. School Three students participated in a 30-minute class every other week. Children individually improvised their own songs during an exploratory session and the researcher evaluated them based on steady beat, meter, differences in duration of notes, and rhythm patterns. Data analysis resulted with a score of *yes* or *no* for maintaining steady beat, establishing and maintaining meter, and using different rhythmic durations. A score of *no pattern* labeled the absence of rhythm patterns, *copied pattern* labeled the use of the researcher’s rhythm pattern, and *extended pattern* described the use of an original pattern or an extension of the researcher’s pattern. An independent judge rated 20% of the improvisations to ensure reliability. All but one four-year-old student maintained steady beat during the improvisation task. All but one five-year-old established and maintained a recognizable meter. The use of same and different rhythmic durations and the use of
rhythm patterns showed statistically significant differences between age groups ($p < .05$). As age increased, skill level increased, including the use of extended rhythm patterns. There was no use of an aptitude test in this study, unlike the present one. Administering an aptitude test will be used to investigate the students’ aptitude scores in relationship to their rhythmic achievement.

**Summary**

Rhythm aptitude and rhythm achievement studies are lacking in research. There are rhythm aptitude tests available that can work in conjunction with achievement assessments. Researchers, however, do not seem to be interested in exploring the avenue of rhythm aptitude and rhythm achievement. Studies tend to focus on visual, audio, or reading methods for rhythm without addressing audiation concepts to see if that could help improve the students’ ability over time in areas like rhythm reading. Gordon (2003) believes that students should first learn to listen, perform (chant), audiate, then read, and notate music. Researchers have not challenged this concept enough to support or discourage it.

**Rhythm Aptitude and Achievement**

The need for music educators to decide upon and choose a methodology for teaching rhythm is critical to the development of the students’ essential rhythmic skills. Methods of teaching rhythm notation appear less clearly defined than teaching tonal achievement, and are “…less frequently subjected to empirical research”
The following research studies focus on achievement with rhythm reading and performance of rhythmic tasks.

**Rhythm reading.** Palmer (1976) conducted a five-month study to discover and compare the effectiveness of two different methods of teaching rhythm reading. Palmer used fourth grade students (N = 136) from three different elementary schools in Orange County, Florida. Each school had two groups of students. One received rhythm reading instruction developed by Richards (1971), based on the Kodály system (n = 48), and one group (n = 50) was taught a method of rhythmic literacy created by Gordon (1971), “…whose approach to rhythmic literacy is an outgrowth of his interest in the measurement of musical aptitude and achievement” (Palmer, 1976, p. 110). The third school had both control groups (n = 38), which received no special instruction. A combination of written and performance achievement in rhythm reading were conducted. The written achievement portion included subtests of Colwell’s Music Achievement Test (MAT, 1969) and the Rhythmic Concepts: Reading Recognition section from Gordon’s Iowa Test of Music Literacy – Level One (1970). Palmer created three criterion measures to evaluate performance in rhythm reading: (a) Response to Meter, (b) Imitation of Rhythmic Patterns, and (c) Rhythmic Notation. The tests helped measure if there was a change in students’ achievement scores based on their group’s method of instruction. Gordon’s Musical Aptitude Profile (MAP) (MAP, 1988) was used to measure students’ musical aptitude. Palmer used a multivariate F ratio to analyze the data. Finn’s Multivariate
program (1966) and Pearson product-moment correlations were used to compute results. Reliability coefficients for pretests varied from .78 to .86. Reliability coefficients for posttests spanned from .93 to .94. Results showed a considerable difference in achievement between the control groups and the groups that received special instruction in rhythm reading. The treatment groups were more successful at the rhythm reading assignment compared to the control group. The correlation between written and performance rhythm achievement pretests was moderate. Palmer concluded that written and performance achievements are separate facets in rhythm reading achievement. Results showed that the MAP scores were most highly correlated with the written rhythm reading achievement posttest scores. An Analysis of Covariance (ANCOVA) revealed a significant relationship for both the control and experimental groups between the posttest achievement gain scores and MAP scores and the pretest achievement scores. A posttest using a univariate analysis did not show a significant difference between performance achievement using either Gordon’s or Richards’ approaches. The results of each method’s approach to developing performance achievement concluded that Gordon’s process was statistically better. However, concerning performance achievement, the data did not specify that the Gordon approach was significantly better than the Richards approach (Palmer, 1976).

Conclusions from Palmer (1976) indicate that music educators are searching for an effective method to teach meter and rhythm reading. Not enough research has been conducted to consistently support a strong method or way to teach
rhythmic and meter concepts. Palmer used Gordon’s MAP (1988) as a test for music aptitude, which poses a similarity to the current study. With the incorporation of audiation-based instruction, it may be possible to avoid the challenges music educators find when teaching notation and music reading.

**Rhythmic tasks.** Schleuter and Schleuter (1989) examined the accuracy and use of clapping, chanting, and stepping among students in Kindergarten, first, second, and third grade. Students from two parochial schools participated in the study. School One (n = 103) obtained two 30-minute music classes a week. School Two (n = 96) had no formal music education, but did receive weekly singing group sessions. The Rhythm Response Test (RRT) (Schleuter & Schleuter, 1985) was used to measure the clapping, chanting, and stepping responses. Twelve tapped rhythm items, six in duple meter and six in triple meter, comprised the RRT. Students responded to the tape-recorded items by clapping, chanting using a neutral syllable, or stepping. Responses were evaluated with a zero, one, or two points depending on accuracy. Composite scores from the PMMA (Gordon, 1986b) taken in the fall and spring were included in the data analysis. Overall, School One performed better than School Two, and mean scores increased as grade level increased within both schools. Stepping scored lowest among both schools and grades, which suggests a link to developmental abilities. Statistically significant relationships occurred between rhythm tasks and grade ($p < .026$), and rhythm tasks and schools ($p < .000$). There was also a significant difference in fall and spring PMMA scores within grade level, in which scores
increased in the spring, except for grade three. Correlations between rhythm responses and PMMA scores for combined schools were all significant \((p < .01)\) except for stepping in third grade.

In this report, an investigation of music aptitude and rhythm achievement took place, which relates to the present study. The difference lies in the method for student responses. The students involved in Schleuter and Schleuter’s (1989) study did not orally respond to rhythm patterns, whereas in the current study, the students will. The current research also focuses on rhythm pattern instruction within the curriculum.

**Summary**

There is very little if no research on rhythm music aptitude and rhythm achievement with the use of audiation-based instruction to develop oral rhythm pattern skills. Schleuter and Schleuter’s (1989) study most closely relates to the current study, since it incorporated PMMA and rhythm achievement. Yet, the focus of how the students responded related mostly to motor rhythmic skills.

**Tonal Aptitude and Tonal Achievement**

Many researchers believe that tonal or singing achievement is a critical element in an elementary general music program. There is a sizable amount of research to support this statement. This section will look at singing achievement and tonal improvisation as related to tonal aptitude. These studies are important to the
current investigation, because the researchers incorporated both music aptitude and music achievement in their examinations.

**Singing achievement.** In a study on musical development and music aptitude, home environment, and instruction, Mota (1997) used 104 children who were age six, from different schools in Portugal. Three schools served as research sites: a state specialist music school (n = 40), a state school in Porto (n = 43), and a state school in Paredes (n = 21). Mota questioned if music aptitude tests could show the full potential and range of a student’s musical ability. The study lasted three full school years. Tracking of students occurred from the beginning of their schooling through the end of third grade. The participants took the PMMA (Gordon, 1986b) Tonal and Rhythm test and performed three different musical tasks prior to formal music instruction: singing, reproducing a short song, and keeping meter while playing along with a recorded rhythm. For the singing and reproducing tasks, accuracy centered on six categories, which were (a) exact reproduction, (b) key stability, (c) some accurate intervals, (d) words and some contour, (e) words without pitch range, and (f) nothing. Sixty-seven percent of the students scored in the first three categories for singing accuracy. Eighty percent scored in the first three categories for reproducing a tune. For the meter task, a 7-point bipolar scale was used to rate the responses, which ranged from complete coordination of meter, to no coordination of meter. Seventy-four percent were able to keep meter based on the first three points of the scale. Analyzed correlations occurred between the three PMMA scores and the scores on singing
achievement, duplicating a tune, and maintaining meter. Mota concluded no significant relationship between tonal music aptitude and tonal achievement on activities such as singing a song in tune, and no significant relationship between rhythm music aptitude and rhythm achievement. In some instances, students who scored very low on the Rhythm subtest demonstrated high performance on the meter achievement task.

Rutkowski (1996) investigated 99 Kindergarteners’ use of singing voice and developmental music aptitude within an individual or small group setting. She believed there was not a significant relationship between singing voice and tonal music aptitude. The control group received large group singing instruction while the treatment group received individual and small group instruction in addition to large group settings. Music classes met for 30-minutes each week. Students took Gordon’s PMMA (1986b) three times during the study: pretest, midtest, and posttest. Rutkowski’s Singing Voice Development Measure (SVDM) (SVDM, 1984) rating scale was used to measure the students’ use of singing voice. The SVDM is a 5-point rating scale ranging from one point for presinger, which is someone who chants the song, to five points for singer, for someone who has an extended vocal range. Administration of the SVDM occurred at the very beginning of the study and at the conclusion of the study. Two judges scored the responses. Interjudge reliability was high for both the pretest ($r = .90$) and for the posttest ($r = .99$). No significant relationships were found to exist between the control and treatment group for PMMA.
scores. Both groups did increase their mean PMMA score during the study and significant differences occurred between the control and treatment group for singing achievement \((p < .03)\). The treatment group resulted in a higher mean score than the control group and no significant relationship between singing voice and developmental tonal music aptitude was found.

Gault (2002) examined the effect of music achievement with whole song versus phrase-by-phrase methods, text versus no text, and developmental music aptitude. Students \((N = 112)\) in Kindergarten and first grade who attended a school in North-Central Connecticut were the participants. Students received one 35-minute music class each week where they learned and performed two folk songs. Only 5 to 10 minutes of each class period involved practicing the folk songs used for the study. The treatment period lasted for a total of eight weeks. Students took Gordon’s Tonal and Rhythm PMMA (1986b) as a pretest. At the end of the treatment, students were individually tested using a 5-point continuous rating scale for tonal and rhythm accuracy, and three independent judges rated the responses. Interjudge reliability ranged from .74 to .92 for the composite scores of both folk songs. A four-way ANOVA was used to analyze the data. The first song produced statistically significant interactions in the presence of text condition and echo-phrase pedagogical procedure, but not in the second song. Gordon’s aptitude test (PMMA, 1986b) and text condition produced a significant main effect. Students with a high music aptitude level attained a much higher score on song achievement than students with a low music aptitude level.
The echo phrase-by-phrase pedagogy helped low music aptitude students perform more accurately. Gault concluded that the effectiveness of text versus no text and whole song versus phrase-by-phrase method depended on the song learned among Kindergarten and first grade students.

Hornbach and Taggart (2005) investigated the relationship between singing achievement and developmental tonal music aptitude. They also examined whether singing achievement differed according to grade level or school setting. Participants in the study were randomly selected students in Kindergarten, first, second, and third grade (N= 162), from two schools in two different school districts. Students received music instruction twice a week for 30 minutes. Prior to treatment, the administration of the Tonal subtest of Gordon’s Primary Measures of Music Audiation (PMMA) (PMMA, 1986b) took place with all participants to determine students’ developmental music aptitude.

A singing achievement test occurred within three weeks of the administration of the PMMA. At both schools, the participants’ general music teacher taught a traditional song, Bow, Bow Belinda for four class periods prior to administering the singing achievement test. Once the four class periods were completed, the researchers took students into a separate room in groups of three to five. Each student sang the song individually. A 5-point continuous rating scale created by the researchers (2005) determined singing achievement. The scale ranged from 5 = nearly or totally accurate singer to 1 = sings or chants song with a different
melodic contour than the song. Performances were audio taped and judged by three music educators.

Pearson’s $r$, PMMA composite means and standard deviations, and a two-way ANOVA were used to analyze the data. Results showed no meaningful relationship between singing achievement and tonal music aptitude; however, they found an increase in singing achievement when singing was part of instruction in the general music classroom. There was a significant main effect for school and grade level. School Two ($m = 9.92$) scored significantly higher on singing achievement compared to School One ($m = 6.53$), and as grade level increased, achievement improved.

**Summary**

Results from all four of these studies indicate a need for more research on musical aptitude and its relationship to teaching methods and techniques. A study regarding which methods are more effective than others could help further the understanding for educators and researchers of how students learn and comprehend musical elements. While the studies above used Gordon’s PMMA (1986b) along with researcher-designed achievement measures, no study used Gordon’s instructional method of Learning Sequence Activities (LSAs) (LSAs, 2001a & 2001b) in conjunction with an aptitude test. Learning Sequence Activities provide a foundation for sequencing instruction so that classroom activities are more meaningful.
The aptitude test diagnoses musical strengths and weaknesses, so when the LSAs occur during instruction time, the teacher can differentiate instruction to meet each student’s individual musical needs. Gault, Hornbach and Taggart, Mota, and Rutkowski’s research could have incorporated the use of Gordon’s LSAs, which would have complemented the use of their music aptitude tests. Mota did not give enough information on specific lessons and activities that took place in the classroom while conducting the research. Gault, Hornbach and Taggart, and Mota did not describe what or how the students learned prior to their investigations. These facts alone make true replication of their work impossible. According to these studies, singing achievement does not significantly relate to music aptitude. Whereas there is a lack of research on rhythm music aptitude and achievement, the current study will focus on these aspects using a curriculum centered on rhythm pattern instruction.

**Tonal improvisation.** Guilbault (2004) investigated “…the effect of harmonic accompaniment on the tonal achievement and tonal improvisations of young children” (p. 64). Kindergarten and first grade students (N = 136) from a private school in Michigan participated in the study. The school used a 6-day cycle, so Kindergarten students received music for 30 minutes, two times per cycle, and first grade students received music for 40 minutes, three times per cycle. The instruction used a method based on Gordon’s Music Learning Theory (2003), and Orff and Kodály techniques. The treatment group received root melody accompaniment 80% of the time with the songs that they learned for the study. The control group received no
root melody accompaniment and sang all the songs *a cappella*. At the end of the 25-week treatment period, children individually performed two songs and improvised an ending to an unfamiliar song without text. Three independent judges rated the students’ responses using a 5-point tonal achievement continuous rating scale and a 5-point improvisation continuous rating scale. Interjudge reliabilities using Pearson’s correlation coefficient ranged from .74 to .86. Results showed a statistically significant difference between the experimental and control group for improvisation (*p* = .01). Additionally, the experimental group’s mean score for improvisation was significantly higher than the control group’s improvisations. There was also a statistically significant difference between grade level and achievement (*p* < .05). A two-way analysis of variance (ANOVA) showed that first grade students scored higher on tonal achievement and improvisation compared to Kindergarten students. There was no significant difference between treatment groups for tonal achievement.

In a study more closely related to the present one, Velez (2009) examined the effect of tonal pattern instruction on the tonal cohesiveness of vocal improvisations and developmental tonal music aptitude. Students in first and second grade (*N* = 182) from a suburban elementary school in Delaware were used for the study. Eight homerooms were involved: two from each grade for the treatment group and two from each grade for the control group. Each class met for 45 minutes, once a week with the researcher. The study occurred over a 41-week period.
The treatment group received Gordon’s Tonal LSAs (2001b), a series of sequenced tonal pattern instruction lessons, which assist the development of audiation. The Tonal subtest of Gordon’s Intermediate Measures of Music Audiation (IMMA) (IMMA, 1986a) was given to all the participants as a pre-, mid-, and posttest to determine if there was a change in developmental tonal music aptitude. At the conclusion of the study, each student was audio-recorded completing five vocal improvisation tasks: creating endings to unfamiliar songs in (a) major tonality and duple meter, (b) major tonality and triple meter, (c) minor tonality and duple meter, (d) minor tonality and triple meter, and (e) improvising an original song.

Two independent judges used a 4-point continuous rating scale to measure the tonal cohesiveness of the ending to the criterion songs and the students’ improvised songs to determine if the vocal improvisations and songs of the treatment group were more tonally cohesive than the vocal improvisations of the control group. Interjudge reliabilities were determined using a Pearson product-moment correlation. First grade reliabilities ranged from a low .398 to a moderate .689 for interjudge reliability. The interjudge reliability for second grade ranged from a low .226 to a moderate .640. T-tests were conducted to determine if there was a significant difference between the control and treatment group for the five vocal improvisation tasks.

First grade scores showed a statistically significant difference at the \( p < .05 \) level with the treatment group creating more tonally cohesive improvisations when
improvising the ending of unfamiliar songs in major and minor tonalities and duple and triple meters compared to the control group. Results for song improvisation did not demonstrate significant differences. Results from the second grade improvisation task scores revealed statistically significant differences at the $p < .05$ level with participants in the treatment group creating more tonally cohesive improvisations for the major/duple meter task, including maintaining keyality for both the minor/triple meter task and the song creation.

Results from the IMMA (Gordon, 1986a) showed that there was no significant relationship from either grade between tonal pattern instruction and developmental tonal music aptitude; nor was there a relationship between vocal improvisation and developmental tonal music aptitude. However, Velez found a significant main effect for time and developmental tonal music aptitude at the $p < .0001$ level. Velez concluded that this significant main effect occurred due to the audiation-based curriculum taught to all students in the study. Velez’s study demonstrated that, with the use of tonal pattern instruction, there appears to be an increased success rate with students creating tonally cohesive vocal improvisations compared to students who do not receive pattern instruction. While the relationship between the IMMA scores and the vocal improvisation tasks were weak, the study revealed that the use of tonal LSAs (Gordon, 2001b) helped students to be successful with tonal improvisation.
Summary

Whereas, Guilbault (2004) explored harmonic accompaniment and vocal improvisation achievement and Velez (2009) researched the effect of tonal pattern instruction on developmental tonal music aptitude and the tonal improvisation of children, the present study will investigate rhythm music aptitude and rhythm achievement in improvisation and aural meter identification. Moreover, the present study will investigate the effects of rhythm music aptitude and rhythm achievement with the use of audiation-based rhythm pattern instruction through Gordon’s Rhythm LSAs (2001a) as a means for developing rhythmically competent students. A closer investigation of age as a factor for developmental rhythm music aptitude and achievement will also take place.

Synthesis

The research studies examined in this literature review relate to the current study in regard to the investigation of rhythm, student achievement, or music aptitude. Many of the researchers were interested in examining student achievement based on a specific method. Some focused on rhythm achievement in the areas of rhythm reading (Shehan, 1987), rhythmic tasks with movement (Groves, 1969; Rainbow, 1981), pattern instruction (Gardner, 1971; Persellin, 1992; Wolf, 2004), and improvisation (Reinhardt, 1990). Others concentrated on rhythm aptitude and rhythm achievement in reading (Palmer, 1976) and rhythmic tasks (Schleuter & Schleuter, 1989). Gault (2002), Hornbach and Taggart (2005), Mota (1997), and Rutkowski (1996) centered
their investigations on tonal aptitude and singing achievement, while Guilbault (2004) and Velez (2009) focused on tonal improvisation as a crucial element to every general music class. There is very little if no research on rhythm music aptitude and rhythm achievement with the use of audiation-based instruction to develop rhythmic improvisational competency. In the present study, the relationship between developmental rhythm music aptitude and improvisational rhythm achievement of first, second and third grade students engaged in a curriculum that focuses on rhythm pattern instruction will be conducted.
Chapter 3

METHODOLOGY

A review of literature on aptitude and achievement demonstrated that there is not enough research on the rhythm-based aptitude and achievement of elementary school children. Many researchers and teachers focus on notation as a way to assess rhythmic achievement. However, if students do not audiate the rhythm patterns, there may not be a full comprehension of notation and beat function. Gordon (2003) believes that the best way to understand rhythm musically is through body movement and the audiation of such movement. Clearly, researchers have not exhausted all possible means of instruction for rhythmic and metrical competency in children. Therefore, the purpose of this study was to investigate the development of rhythm competency in elementary school children who engaged in a curriculum that focused on rhythm pattern instruction. The specific research questions of this study were:

1. Is there a relationship between developmental rhythm music aptitude as measured by Primary Measures of Music Audiation (PMMA) (Gordon, 1986b) and rhythm achievement of first, second, and third grade students?

2. Does the relationship between developmental rhythm music aptitude and rhythm achievement change with age?
3. Does age have an effect on rhythm achievement?

Setting of the Study

School overview. The study conducted by the teacher-researcher was at a suburban elementary school, located in the mid-Atlantic seaboard of the United States. At the time, there were 24 schools in the district: three high schools, four middle schools, and 17 elementary schools. Approximately 18,000 students obtained educational services in this district, which included suburban and city areas. The school district offered a choice program to all students, which allowed children to apply to schools that were either outside the district or outside the designated feeder pattern where they resided. The elementary school involved in the study supported approximately 700 students in grades Kindergarten through fifth. The surrounding towns of the elementary school involved in this study were diverse in race and socioeconomics. The school was large with a racially diverse group of students, African American being the dominant race. African-Americans made up 52.5 % of the population, 33.3% were Caucasian, 10.6% were Hispanic, 6% were American Indian, and 3.1% were Asian-American. About one-half of the school populations came from low-income families. Due to the choice program, some students commuted from other districts to attend this particular school.

Music room. The music room was spacious. There were two walls of built-in cabinets to allow for the storage of large items such as tubano drums, xylophones, and music textbooks. The cabinets also housed a large amount of smaller
pitched and un-pitched instruments and curriculum materials. This allowed the teacher-researcher a great amount of space for instruction. Instruments that could not fit in the cabinets, like bass xylophones, rested near the wall. The classroom was also equipped with music recordings, a stereo, and an upright piano. Informative posters lined the walls and cabinets. All students sat in chairs, which surrounded three sides of a large area rug. This set up allowed for appropriate sitting space for each student, but also room to get up and move during an activity.

Participants

Students. Participants in this study (N = 183) were in grades one through three, from 10 intact homerooms: third grade (n = 45), second grade (n = 77), and first grade (n = 61). Every homeroom attended a general music class once a week for 45 minutes, taught by the teacher-researcher. The length of the study was five months long and occurred during the regularly scheduled 2008-2009 school year.

Teacher-researcher. The teacher-researcher was a part-time graduate student at the University of Delaware. Her full-time job was teaching elementary general music at the school where this study was conducted. The teacher-researcher earned a Bachelor of Music Education degree from the University of Delaware in 2001 and had six years of experience teaching music in a school setting prior to this study. She also had experience teaching early childhood music and currently teaches piano both in a class setting and privately. The teacher-researcher holds the Elementary General Music Level 1 certificate from the Gordon Institute of Music
Learning and is a member of the Gordon Institute of Music Learning (GIML) mid-Atlantic organization and MENC, The National Association for Music Education.

**Human subjects.** Before beginning the study, the teacher-researcher discussed and explained the research with her school administrator. The University of Delaware Human Subjects Review Board and the school district gave approval of this study (see Appendix A). Since the research used human subjects, all data collected was kept confidential. Information letters, which gave a brief description and reason for the study, went home with all participants to obtain guardian consent (see Appendix B). The letters did not require parent/guardian signatures to indicate consent, but required contact with the school for a student to be excluded from participating. No parent or guardian excluded his/her child from the study. Of the 50 third grade students who began the study, two moved during the middle of the research, and three were absent during the final assessments. There were nine of 86 second grade students and seven of 68 first grade students who were absent during one of the assessments; their data were excluded from the study.

**Curriculum**

**Overview.** The teacher-researcher’s basis for her music curriculum is the Delaware Statewide Recommended Curriculum for the Visual and Performing Arts and Gordon’s Music Learning Theory (2003). Students engaged in singing (independent and echo singing), chanting, moving, listening, improvising, playing instruments, and tonal and rhythmic beat competency practice throughout first,
second, and third grade. Lessons were similar between grade levels, but they differed in objectives and task requirements depending on the age and skill level of the group.

For students in this school, their musical foundation begins in first grade. All first grade students listen and practice identifying, singing, and audiating the resting tone of songs in different tonalities on a neutral syllable. Students practice keeping macrobeats with their heels and microbeats with their hands in a variety of meters during chanting, singing, and audiating. Students’ demonstration of macrobeats and microbeats and singing of the resting tone occur during each lesson and skill requirement, such as instrument playing, movement, improvisation, and meter identification. Rhythm patterns at the Aural/Oral level are introduced through echo chanting, and then move into improvisation using a same pattern versus different pattern method. The teacher-researcher chants a pattern on a neutral syllable and the student responds with a different pattern. Notational devices were not used during this study.

**First grade.** By the end of first grade, students are expected to be able to sing the resting tone on a neutral syllable within a group and individually, and chant and improvise simple rhythmic patterns in duple and triple meters at the Verbal Association level where they chant using beat function syllables.²

² Beat function syllables are used to identify different durations within a rhythm pattern. The syllables used are centered upon macrobeats, microbeats, divisions, and elongations “…rather than on the time-value names of notes” (Gordon, 2000, p. 168).
Second grade. In second grade, the lessons continue to focus on singing and audiating the resting tone of songs in multiple tonalities; students are expected to independently sing the resting tone in multiple tonalities, and sing songs on pitch. Macrobeat and microbeat competency is at the Verbal Association skill level, in which students chant with beat function syllables, however, the lessons now include rhythmic divisions. Students perform rhythm patterns by echo chanting and improvise in duple and triple meters, chanting with beat function rhythm syllables. They also practice identifying the meter of a given tune or chant.

Third grade. By the end of the second marking period of third grade, students are expected to independently sing songs on pitch and sing the resting tone of songs in multiple tonalities. They physically demonstrate macrobeats and microbeats in duple meter, triple meter, and unusual meter, identify the meter of a given tune or chant, improvise rhythm patterns in duple and triple meters using rhythm syllables, and play pitched and un-pitched instruments to accompany songs and rhythm chants.

By the end of third grade, students are expected to independently demonstrate the additional, following skills: (a) sing tonic and dominant roots in major and minor tonalities on a neutral syllable, (b) play those same roots on a pitched instrument, (c) chant and improvise rhythmic patterns in duple and triple meters using correct rhythm syllables (including divisions), and (d) play and improvise rhythmic patterns in duple and triple meters on un-pitched instruments.
Assessment. The teacher-researcher, in solo and group situations, gives assessments of student musical achievement. For this particular study, Gordon’s Rhythm Learning Sequence Activities (LSAs, 2001a) provided concentrated rhythm instruction. Unit 1, Section A and B, Criterion 1 and Unit 2, Section B and C, Criterion 1 were used for this particular study (see Appendix C). LSAs were the method used to teach and assess student learning of macrobeats and microbeats in duple meter and triple meter, first, without beat function syllables (Aural/Oral) and then with beat function rhythm syllables (Verbal Association). During formal rhythm pattern instruction, students physically kept macrobeats in their heels and microbeats in their hands. The teacher-researcher also used rhythmic accuracy assessments such as having students chant same versus different rhythm patterns from the teacher’s or a peer’s pattern with syllables. Assessments and lessons were void of notation.

Learning Sequence Activities (LSAs)

In 1971, through extensive research, Gordon created a taxonomy of tonal and rhythm patterns. In his final investigation of rhythm patterns throughout one school year, Gordon analyzed 486 rhythm patterns by having students listen to recordings of them. Gordon determined the perceptual and audiotational difficulty levels of the patterns based on the answers given by the students. “The listener reacts to immediate impressions with intuitive responses, in terms of sameness and difference, to what is aurally perceived” (Gordon, 1986b, p. 8). As a result, three levels of
difficulty classified the patterns and each pattern was categorized as *easy, moderate, or difficult.*

These patterns became Learning Sequence Activities (LSAs), an instructional method that creates a foundation through audiation for tonal and rhythmic music achievement in a general music classroom (Gordon, 2001c). Rhythm LSAs allow the teacher to provide instruction that meets a student’s individual needs and helps students build a rhythm pattern vocabulary (Gordon, 2001a). Used for no more than 10 minutes of class time, Rhythm LSAs develop beat competency and are a sequential means for teaching students how to audiate rhythm and meter.

Prior to receiving LSA instruction, a valid and reliable music aptitude test is given to students so that instruction may be differentiated according to students’ musical needs. Students with high music aptitude are expected to be able to perform the easy, moderate, and difficult patterns; those with moderate aptitude, the easy and medium patterns, and those with low music aptitude, the easy pattern. All students respond to individual and class patterns. First, the teacher chants a pattern; then a single student chants the same pattern with the teacher, and then that student chants the same pattern alone at another time. If the student is successful with solo chanting at the easy level of instruction, she moves to the pattern at the next level of difficulty, eventually through medium and high difficulty patterns, according to her ability. Individual pattern instruction ceases when a student is unsuccessful with a pattern after two tries. In-between individual patterns, class patterns, created by the teacher-
researcher, are chanted to help maintain a steady beat, and keep the students challenged and engaged during individual patterns. During LSA instruction, students physically keep macrobeats in their heels and microbeats in their hands. LSAs are most effective when used in conjunction with a reliable and valid music aptitude test.

Procedural Overview

Instruction. The purpose of the study was to determine the relationship between developmental rhythm music aptitude and rhythm achievement of first, second, and third grade students who engaged in a curriculum that focused on rhythm pattern instruction. The study was conducted from January through May, for five months. During the beginning of each class period, all participants engaged in 5 to 10 minutes of formal rhythm pattern instruction, which assisted in the development of audiating rhythm patterns. Gordon’s Learning Sequence Activities taken from Jump Right In: Rhythm Register Book I (Gordon, 2001a) (see Appendix C) were used for this portion of the lesson. Pattern instruction alternated each week between duple meter and triple meter patterns. All classes began with Unit 1 in the Rhythm Register Book 1, which was at the Aural/Oral skill level. By the middle of February, all classes began Unit 2, which introduced rhythm syllables at the Verbal Association skill level. The remaining time in class each week involved instruction that focused on tonal and rhythm audiation, development of beat competency, identifying the meter of a given tune or chant, movement, rhythmic improvisation, correct use of the singing voice, and the use of pitched and un-pitched instruments. Improvisation activities were
included in almost all of the lessons. The improvisation activities allowed students to bridge to a higher level of learning by spontaneously audiating and performing rhythmic patterns in duple and triple meters. During the time the students were working on Unit 1 of the Learning Sequence Activities, they had opportunities to improvise using neutral syllables. The students had rhythmic conversations with the teacher-researcher and with each other. Once the students moved to Unit 2, rhythmic conversations were chanted using rhythm syllables at the Verbal Association skill level. Bridging to improvisation allowed students an opportunity to develop their rhythmic dialogue vocabulary. Visual notation of the patterns was not part of the current study. Every class involved in the study received the same amount of instruction time with similar lessons, adapted developmentally for each grade level. There was one exception to this: due to school being cancelled from heavy snowfall, each grade had one less music class.

At the beginning of the study, the teacher-researcher demonstrated how to improvise a rhythm pattern by holding up two fists with her hands and chanting a four macrobeat pattern in duple or triple meter to represent a same response. The teacher-researcher then demonstrated the chanting of a four macrobeat pattern in duple or triple meter while holding up one hand in a fist and one hand open to represent a different response. The teacher-researcher told students that when she chanted a pattern, they were to chant a different response in the same meter with the same number of macrobeats. These restrictions formed a basis for the students to improvise
within. The teacher-researcher and class, as a whole, practiced this protocol. Then, the
teacher-researcher asked individuals to participate. For individual students, the
teacher-researcher chanted either one of four patterns in duple meter or one of four
patterns in triple meter, using four macrobeat patterns comprised of macrobeats and
microbeats for students to respond. Students improvised a rhythm pattern in response.

**Criterion Measures**

**Primary Measures of Music Audiation (PMMA).** Primary Measures of
Music Audiation (PMMA) (Gordon, 1986b) is an auditory discrimination test
designed to measure developmental music aptitude for students in Kindergarten
through third grade. The test provides an evaluation of a student’s developmental
music aptitude, or an assessment of a student’s potential to learn musical concepts and
skills. PMMA is comprised of two subtests, Tonal and Rhythm, each about 20 minutes
in length. Both subtests have pre-recorded patterns on CD, and consist of 40 items and
practice examples. For each subtest, the student listens and identifies whether the tonal
or rhythm patterns are the same or different and circles the appropriate box to
designate her answer (see Appendix D). A picture labels each test item. The voice on
the CD announces the name of the object, and then says, “First” and the first pattern is
given using one pitch on a synthesizer. Then the voice says, “Second” and the second

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3 Gordon (2000) defines developmental music aptitude as “…music potential that is affected
by the quality of environmental factors. A child is in the developmental music aptitude stage
from birth to approximately nine years of age” (p. 160).
pattern is given using the same pitch on the synthesizer. The student has time to audiate what she heard and mark it appropriately on the answer sheet. The Tonal and Rhythm subtest administrations need to occur on separate days. For the present study, the students only took the Rhythm subtest as a pretest and a posttest. The teacher-researcher followed the instructions written in the test manual in order to ensure validity of the test administration.

PMMA has a strong reliability as a measure for music aptitude, which means there should be a stable outcome when administering the test. The composite reliability coefficient for rhythm is reported in the test manual to be $r = .82$ for Kindergarten through third grade. The reliabilities for each individual grade as reported in the test manual are as follows: Kindergarten, $r = .72$; grade one, $r = .85$; grade two, $r = .86$; grade three, $r = .86$. Due to the unstable nature of developmental rhythm music aptitude, PMMA was administered as a posttest within three weeks of the rhythm achievement tasks for this study.

**Rhythm achievement tests.** During the second week of May, all participants took an oral improvisation test in duple meter. Each student’s response was individually audio-recorded. Students sat in assigned chairs. There were five different rows of chairs, surrounding an area rug. Depending on how many students there were in a particular homeroom, some rows remained empty. Before beginning the assessment, the teacher-researcher explained to the students that they were going to complete a *same* versus *different* rhythm pattern activity individually with her. The
class chanted a few practice patterns. First, the class repeated the pattern given by the teacher-researcher. She held her hands up with two fists to show *same*. After a few patterns, the teacher-researcher asked the class to chant a *different* pattern based on the pattern chanted by her. She held up one fist and one hand open to show *different*. Once that was complete, the teacher-researcher set the beat and tempo by physically keeping macrobeats in her heels and microbeats in her hands, which was a signal for the entire class to join in. The teacher-researcher then stood in front of the first student being assessed, spoke their name and said, “Ready, here we go” in rhythm, and then orally chanted a four-beat pattern in duple meter on a neutral syllable. The teacher-researcher randomly chose from four different rhythm patterns, which she used for the assessment. The choices used were as follows:
The student’s goal was to respond by orally chanting a different improvised four-beat pattern in duple meter, using a neutral syllable, than what the teacher-researcher chanted. The same oral test occurred during the third week of May in triple meter. The four different triple meter patterns chanted by the teacher-researcher were:
Students were audio-recorded performing the tasks with an iPod recorder. To measure the rhythmic accuracy of the students’ improvisations, two independent judges scored each improvisation using the same 5-point continuous rating scale (Burton, 2008) (see Appendix E). Visual notation for the students was not used during this study.

**Meter-labeling test.** During that same week, the participants also took a meter-labeling test during class time in the music room (see Appendix F). Students were asked to come to the front of the room and pick up a test paper and a pencil, find a spot in the room and sit in self-space. Once everyone had the needed materials and
found a spot in the room, the teacher-researcher asked the students to put their name and homeroom number at the top of the paper. The test had 15 items, with the words *duple* and *triple* written after the item number. Of the 15 patterns used for the test, seven were triple meter patterns and eight were duple meter patterns, which were presented in random order. The patterns included macrobeats, microbeats, and half of the patterns included divisions. There was one practice item at the top of the page (see Appendix G). Prior to administering the test, the teacher-researcher gave the following instructions:

This is a labeling test. You are going to hear me chant a pattern using a neutral syllable and you have to decide if I am chanting in duple meter or triple meter. Remember, when you are audiating the chant that I spoke, you should audiate *du-de* for duple meter, and *du-da-di* for triple meter. I will tell you which number we are on, and then I will chant the pattern. You will have a little time to audiate what you just heard, and then I will repeat the item number again and chant the pattern a second time. If you are not sure of an answer, just take a guess. Make sure to circle only *one* of the choices, duple or triple, on your paper. Let us try the example together. Everybody look at the item named “example” underneath where you put your homeroom number. There is the word *duple* and *triple*. I will chant a pattern. You need to either circle *duple* if you thought I chanted in duple meter or *triple* if you think I chanted in triple meter. Remember, I will chant the pattern two times so you have a chance to hear it again.

The teacher-researcher chanted a practice pattern two times, using a neutral syllable, pausing in between, and then revealed the correct answer to the example item. If there were questions from the students, the teacher-researcher answered them at this time. Once that was complete, the test began. The actual test took approximately 10
minutes. At the completion of the assessment, the teacher-researcher collected materials and test papers. Later, the teacher-researcher graded all meter-label tests.

**Data Collection**

**Primary Measures of Music Audiation (PMMA).** The administration of PMMA at the end of the study was used as a posttest to determine if there was a relationship between developmental rhythm music aptitude and rhythm achievement. A verification of students’ level of rhythm music aptitude resulted in tallying all of the correct answers to obtain a raw score.

**Rhythm achievement tasks.** The oral improvisation tests in duple and triple meters were given during class in back-to-back weeks; duple meter the first week, triple meter the second week. Each student’s response was audio-recorded using an iPod recorder, which the teacher-researcher held in her hand so as to easily move from one child to the next in each row. It took approximately five to seven minutes of class time for the teacher-researcher to collect response data from all of the students in each of the classes.

**Labeling test.** During the same class period as the triple meter rhythm achievement task, students took a written meter-labeling test. The teacher-researcher administered a 15-item paper and pencil test in which students were asked to identify if a pattern, chanted on a neutral syllable by the teacher-researcher, was in duple or
triple meter. Students circled the word *duple or triple* on the test paper. The written meter-labeling test was graded by the teacher-researcher.

**Data Analysis**

Data were collected and organized to answer the three specific research questions.

Two independent judges scored the improvised rhythm patterns for the oral rhythm improvisation assessments, using a 5-point continuous rating scale. Both independent judges had a Bachelor of Music degree and were music teachers. Pearson product-moment correlations confirmed interjudge reliability.

Descriptive statistics were computed for each measure. To determine whether a relationship existed between students’ rhythm music aptitude and composite rhythm music achievement, Pearson product-moment correlations were computed. To determine whether the relationship of rhythm music aptitude and rhythmic achievement changed with age, a comparison of Pearson’s *r* across grade level was used. To determine whether age had an effect on rhythm achievement, a one-way ANOVA was computed.

The next chapter will present the data and results obtained from this study. Tables, graphs, and descriptive analyses will be provided to answer each research question.
Chapter 4
DATA ANALYSIS AND RESULTS

The purpose of this study was to determine if a relationship existed between developmental rhythm music aptitude and rhythm achievement of first, second, and third grade students who engaged in a curriculum that focused on rhythm achievement. Specific research questions addressed were: (a) Is there a relationship between developmental rhythm music aptitude as measured by PMMA (Gordon, 1986b) and rhythm achievement of first, second, and third grade students? (b) Does the relationship between developmental rhythm music aptitude and rhythm achievement change with age? and (c) Does age have an effect on rhythm achievement?

One-hundred and eighty-three students from a suburban elementary school located in the mid-Atlantic seaboard of the United States participated in this study. The 10 intact classes involved in the study were those, which coincided with each other so that each homeroom involved had the same amount of music classes and exposure. Participants met for 45 minutes each week, for five months. All participants of the study completed three rhythmic achievement tasks over a two-week period during the second and third week of May. Each student’s oral response was audio-recorded using an iPod recorder. Two independent judges, using a 5-point continuous
rating scale (Burton, 2008) (see Appendix E), scored the improvised rhythm patterns for the oral assessments. The teacher-researcher scored the written meter-label test. During the last week in May, students were administered the rhythm subtest of the PMMA. The next section will discuss and explain the data that were collected and analyzed for first, second, and third grade students.

Procedural Overview

Data were collected and analyzed to investigate the specific research questions using the following statistics: (a) descriptive statistics of means and standard deviations for the four dimensions of the rhythmic assessments, composite achievement scores, and PMMA scores, (b) interjudge reliabilities for the oral rhythm pattern improvisation, (c) Pearson product-moment correlations to examine the relationships of students’ rhythm music aptitude and the individual rhythmic music achievement task scores, including composite scores and to determine whether the relationship of rhythm music aptitude and rhythmic achievement changed with age, and (d) a one-way ANOVA to determine whether age affected rhythm achievement.

Rhythm Achievement Tasks

All participants of the study completed three rhythmic achievement tasks over a two-week period at the end of the study. The tasks were: (a) orally improvise a four-beat pattern in duple meter, (b) orally improvise a four-beat pattern in triple
meter, and (c) aurally identify duple or triple meter through a written label test (see Appendices E and F).

Students’ oral rhythmic improvisation achievement was assessed using a 5-point continuous rating scale (Burton, 2008) to determine their ability to maintain steady beat, meter, and tempo (see Appendix E) for a possible raw score ranging from 0 to 20 points. The teacher-researcher assessed the written meter-label responses by adding up all the correct answers to obtain a raw score, which ranged from 0 to 15.

**Primary Measures of Music Audiation**

**Data Analysis**

To address whether there was a relationship between developmental rhythm music aptitude and rhythm achievement and whether the relationship between developmental rhythm music aptitude and rhythm achievement changed with age, means and standard deviations for first, second, and third grade posttest PMMA rhythm aptitude tests are displayed in Table 1 and Figure 1. As can be seen, as grade level increased, rhythm music aptitude increased.
Table 1

PMMA Posttest Means and Standard Deviations

<table>
<thead>
<tr>
<th>Grade</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>27.34</td>
<td>5.36</td>
</tr>
<tr>
<td>2</td>
<td>29.32</td>
<td>4.41</td>
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<td>3</td>
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<td>3.28</td>
</tr>
<tr>
<td>Composite:</td>
<td>29.56</td>
<td>4.35</td>
</tr>
</tbody>
</table>

First grade n = 61, Second grade n = 77, Third grade n = 45; Possible total = 40

Figure 1. PMMA Posttest Means
Interjudge Reliability

Data Analysis

Two independent judges scored the students’ improvised rhythm patterns of the oral assessments using a 5-point continuous rating scale (Burton, 2008) (see Appendix E). The judges scored the duple and triple meter oral improvisation assessments to determine the students’ ability to maintain, steady beat, meter, and, tempo. Pearson product-moment correlations were used to determine the interjudge reliability for the duple and triple meter oral rhythm improvisation achievement tasks and composite scores. The judges’ scores for both the duple and triple meter oral improvisations were compiled. A Pearson product-moment correlation was used to examine the relationship between students’ rhythm music aptitude and individual and composite rhythmic music achievement, and to examine if the relationship of rhythm music aptitude and rhythmic achievement changed with age. A one-way ANOVA was used to conclude whether age affected rhythm achievement.

Interjudge reliabilities for first, second, and third grade students’ oral rhythm improvisation patterns were found to be very strong as presented in Table 2. For first grade, the reliability was strongest for duple meter patterns as compared to triple meter patterns. Interjudge reliabilities were even closer for second grade, as seen in Table 2. The reliability ranged from .95 for triple meter to .98 for duple meter. There was a larger gap in third grade between the interjudge reliabilities of duple and triple meter (see Table 2), but the overall reliability was strong. Since the interjudge
reliabilities were strong, combined scores from the two judges supported the remaining statistical analyses for all three grades.

Table 2

*Interjudge Reliabilities*

<table>
<thead>
<tr>
<th>Grade</th>
<th>Task</th>
<th>Duple Meter</th>
<th>Triple Meter</th>
<th>Composite</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Grade</td>
<td>Improvised patterns</td>
<td>.96</td>
<td>.91</td>
<td>.92</td>
</tr>
<tr>
<td>Second Grade</td>
<td>Improvised patterns</td>
<td>.95</td>
<td>.98</td>
<td>.97</td>
</tr>
<tr>
<td>Third Grade</td>
<td>Improvised patterns</td>
<td>1.00</td>
<td>.86</td>
<td>.93</td>
</tr>
</tbody>
</table>

*p < .05*

**Primary Measures of Music Audiation and Rhythm Achievement Tasks**

**Data Analysis**

Means and standard deviations were computed for the rhythmic achievement tasks. Pearson product-moment correlations were computed to examine the relationship between first, second, and third grade students’ rhythm music aptitude scores and rhythm music achievement. The teacher-researcher compared PMMA
scores and the rhythm achievement test scores, including the composite scores of both the oral improvisation rhythm patterns and written meter-label test. The highest score possible for each of the oral rhythm achievement tasks was 10, for a possible composite total of 20 points. The highest score possible for the written meter-label assessment was 15 points: eight points for duple meter and seven points for triple meter.

**First grade results.** Table 3 reveals the means and standard deviations for first grade students’ duple and triple meter oral rhythmic improvisation tasks, written meter-label assessment, and composite scores.

**Table 3**

*First Grade Means and Standard Deviations for Oral and Written Achievement Tasks*

<table>
<thead>
<tr>
<th>Task</th>
<th>Element</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral</td>
<td>Duple</td>
<td>8.57</td>
<td>2.97</td>
</tr>
<tr>
<td></td>
<td>Triple</td>
<td>7.72</td>
<td>3.03</td>
</tr>
<tr>
<td></td>
<td>Composite</td>
<td>16.30</td>
<td>4.52</td>
</tr>
<tr>
<td>Written</td>
<td>Duple</td>
<td>4.69</td>
<td>1.74</td>
</tr>
<tr>
<td></td>
<td>Triple</td>
<td>3.36</td>
<td>1.85</td>
</tr>
<tr>
<td></td>
<td>Composite</td>
<td>8.05</td>
<td>2.37</td>
</tr>
<tr>
<td>Oral &amp; Written</td>
<td>Composite</td>
<td>24.34</td>
<td>5.22</td>
</tr>
</tbody>
</table>

n = 61; Oral total=20; Written total=15; Composite total=35
Second grade results. Table 4 presents means and standard deviations for second grade students’ duple and triple meter oral rhythmic improvisation tasks and their meter-label assessment, including the composite scores.

Table 4

Second Grade Means and Standard Deviations for Oral and Written Achievement Tasks

<table>
<thead>
<tr>
<th>Task</th>
<th>Element</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral</td>
<td>Duple</td>
<td>7.97</td>
<td>3.55</td>
</tr>
<tr>
<td></td>
<td>Triple</td>
<td>7.48</td>
<td>3.16</td>
</tr>
<tr>
<td></td>
<td>Composite</td>
<td>15.45</td>
<td>5.30</td>
</tr>
<tr>
<td>Written</td>
<td>Duple</td>
<td>4.44</td>
<td>1.53</td>
</tr>
<tr>
<td></td>
<td>Triple</td>
<td>4.01</td>
<td>1.40</td>
</tr>
<tr>
<td></td>
<td>Composite</td>
<td>8.45</td>
<td>2.41</td>
</tr>
<tr>
<td>Oral &amp; Written</td>
<td>Composite</td>
<td>23.91</td>
<td>6.32</td>
</tr>
</tbody>
</table>

n = 77; Oral total=20; Written total=15; Composite total=35

Third grade results. Means and standard deviations for the duple and triple oral rhythmic improvisation tasks and the meter-label assessment, including the composite scores for third grade students comprise Table 5.
Table 5

*Third Grade Means and Standard Deviations for Oral and Written Achievement Tasks*

<table>
<thead>
<tr>
<th>Task</th>
<th>Element</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral</td>
<td>Duple</td>
<td>8.98</td>
<td>2.85</td>
</tr>
<tr>
<td></td>
<td>Triple</td>
<td>7.60</td>
<td>2.67</td>
</tr>
<tr>
<td></td>
<td>Composite</td>
<td>16.58</td>
<td>4.02</td>
</tr>
<tr>
<td>Written</td>
<td>Duple</td>
<td>5.09</td>
<td>1.44</td>
</tr>
<tr>
<td></td>
<td>Triple</td>
<td>4.44</td>
<td>1.47</td>
</tr>
<tr>
<td></td>
<td>Composite</td>
<td>9.53</td>
<td>2.63</td>
</tr>
<tr>
<td>Oral &amp; Written</td>
<td>Composite</td>
<td>26.11</td>
<td>4.75</td>
</tr>
</tbody>
</table>

n = 45; Oral total=20; Written total=15; Composite total=35

Rhythm Music Aptitude and Rhythmic Achievement

Data Analysis

Tables 6, 7, and 8 show the results of the Pearson product-moment correlations for rhythm music aptitude and rhythmic achievement for each grade. Significant intercorrelations between composite meter-label scores and duple and triple meter-label scores as well as between composite oral achievement scores and duple and triple meter oral scores are to be expected.
**First grade results.** Results for the analysis of the first grade scores showed weak correlations for all aspects of rhythm achievement as related to music aptitude (see Table 6). Interestingly, weak, inverse correlations were found between (a) duple meter-label and triple meter-label scores, (b) duple meter-label and oral triple meter improvisation scores, and (c) triple meter-label and triple meter oral improvisation test scores. There were weak correlations between (a) developmental music aptitude and composite oral rhythm improvisation achievement and (b) developmental music aptitude and composite meter-label achievement.
Table 6

First Grade Correlations for Oral and Written Achievement Tasks and Posttest PMMA Scores

<table>
<thead>
<tr>
<th></th>
<th>PMMA</th>
<th>Label Duple</th>
<th>Label Triple</th>
<th>Label Composite</th>
<th>Oral Duple</th>
<th>Oral Triple</th>
<th>Oral Composite</th>
<th>Oral &amp; Label Composite</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMMA</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Label Duple</td>
<td>0.19</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Label Triple</td>
<td>0.29</td>
<td>-0.13</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Label Composite</td>
<td>0.36</td>
<td>0.63</td>
<td>0.69</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral Duple</td>
<td>0.18</td>
<td>0.16</td>
<td>0.06</td>
<td>0.16</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral Triple</td>
<td>0.36</td>
<td>-0.04</td>
<td>-0.06</td>
<td>-0.08</td>
<td>0.13</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral Composite</td>
<td>0.36</td>
<td>0.08</td>
<td>0.00</td>
<td>0.05</td>
<td>0.75</td>
<td>0.76</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Oral &amp; Label Composite</td>
<td>0.48</td>
<td>0.35</td>
<td>0.31</td>
<td>0.50</td>
<td>0.72</td>
<td>0.62</td>
<td>0.89</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*p < .05  n = 61

**Second grade results.** There was no meaningful relationship between developmental music aptitude and rhythm achievement for second grade students. The correlations between second grade students’ rhythm achievement task scores and
music aptitude scores yielded weak relationships for each dimension of rhythm achievement (see Table 7).

Table 7

*Second Grade Correlations for Oral and Written Achievement Tasks and Posttest PMMA Scores*

<table>
<thead>
<tr>
<th></th>
<th>PMMA</th>
<th>Label Duple</th>
<th>Label Triple</th>
<th>Label Composite</th>
<th>Oral Duple</th>
<th>Oral Triple</th>
<th>Oral Composite</th>
<th>Oral &amp; Label Composite</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMMA</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Label Duple</td>
<td>0.12</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Label Triple</td>
<td>0.20</td>
<td>0.35</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Label Composite</td>
<td>0.20</td>
<td>0.84</td>
<td>0.80</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral Duple</td>
<td>0.04</td>
<td>0.24</td>
<td>0.27</td>
<td>0.30</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral Triple</td>
<td>0.05</td>
<td>0.02</td>
<td>0.07</td>
<td>0.05</td>
<td>0.24</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral Composite</td>
<td>0.06</td>
<td>0.17</td>
<td>0.22</td>
<td>0.24</td>
<td>0.82</td>
<td>0.76</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Oral &amp; Label Composite</td>
<td>0.12</td>
<td>0.46</td>
<td>0.49</td>
<td>0.58</td>
<td>0.80</td>
<td>0.66</td>
<td>0.93</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*p < .05  n = 77
**Third grade results.** Results for the correlation of rhythm achievement and music aptitude scores showed no significant relationship (see Table 8). Multiple, weak inverse correlations were found to exist for (a) music aptitude and the triple meter oral improvisation test scores, (b) duple meter-label and duple meter oral improvisation test scores, and (c) duple meter-label and triple meter oral improvisation test scores. There was also an inverse correlation between triple meter-label and duple meter oral improvisation test scores. One correlation between the duple meter-label and the triple meter-label test scores was moderately strong \((r = .62)\). It is possible that these results show that for this particular study, there are no meaningful relationships between the developmental music aptitude and rhythmic achievement of the students.
### Table 8

*Third Grade Correlations for Oral and Written Achievement Tasks and Posttest PMMA Scores*

<table>
<thead>
<tr>
<th>PMMA</th>
<th>PMMA</th>
<th>Duple</th>
<th>Duple</th>
<th>Triple</th>
<th>Triple</th>
<th>Composite</th>
<th>Composite</th>
<th>Composite</th>
<th>Composite</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMMA</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Label</td>
<td></td>
<td>0.23</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duple</td>
<td></td>
<td></td>
<td>0.62</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triple</td>
<td></td>
<td></td>
<td></td>
<td>0.09</td>
<td>0.62</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Label</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.18</td>
<td>0.90</td>
<td>0.90</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Composite</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duple</td>
<td></td>
<td>0.07</td>
<td>-0.03</td>
<td>-0.02</td>
<td>-0.03</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triple</td>
<td></td>
<td>-0.27</td>
<td>-0.09</td>
<td>0.08</td>
<td>0.00</td>
<td>0.06</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Composite</td>
<td></td>
<td>-0.13</td>
<td>-0.08</td>
<td>0.04</td>
<td>-0.02</td>
<td>0.75</td>
<td>0.71</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Oral &amp; Label</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Composite</td>
<td></td>
<td>-0.01</td>
<td>0.43</td>
<td>0.53</td>
<td>0.53</td>
<td>0.62</td>
<td>0.60</td>
<td>0.83</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*p < .05  n = 45

**Composite score results.** Table 9 shows the composite correlations of all three grades for music aptitude and the oral improvisation and written achievement tasks. There were no significant relationships found for the composite scores for achievement and rhythm music aptitude.
Interpretation of Results

No significant relationship between developmental rhythm music aptitude and rhythm achievement of students in first, second, or third grade, who were engaged in a curriculum that focused on rhythm pattern instruction, was found. In regard to the relationship between rhythm achievement tasks, only one moderately strong relationship was found to exist; third grade students’ duple meter-label and triple meter-label achievement was significant at the $r = .62$ level.
Table 9

*First, Second, and Third Grade Correlations for Oral and Written Achievement Tasks and Posttest PMMA Scores*

<table>
<thead>
<tr>
<th></th>
<th>PMMA</th>
<th>Label Duple</th>
<th>Label Triple</th>
<th>Label Composite</th>
<th>Oral Duple</th>
<th>Oral Triple</th>
<th>Oral Composite</th>
<th>Oral +Label Composite</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMMA</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Label Duple</td>
<td>0.19</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Label Triple</td>
<td>0.29</td>
<td>0.21</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Label Composite</td>
<td>0.31</td>
<td>0.77</td>
<td>0.78</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral Duple</td>
<td>0.11</td>
<td>0.17</td>
<td>0.13</td>
<td>0.19</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral Triple</td>
<td>0.11</td>
<td>-0.02</td>
<td>0.01</td>
<td>-0.01</td>
<td>0.17</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral Composite</td>
<td>0.14</td>
<td>0.10</td>
<td>0.10</td>
<td>0.13</td>
<td>0.78</td>
<td>0.75</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Oral +Label Composite</td>
<td>0.26</td>
<td>0.43</td>
<td>0.43</td>
<td>0.55</td>
<td>0.75</td>
<td>0.63</td>
<td>0.90</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*p < .05  N = 183
Rhythm Music Aptitude, Rhythmic Achievement, and Age

Interpretation of Results

The results, as seen in Figure 2, address the research question regarding whether the relationship between developmental rhythm music aptitude and rhythm achievement changed with age. As age increased, the relationship between rhythm music aptitude and rhythm achievement decreased. First grade students’ composite rhythm achievement score correlations were the strongest compared to second and third grade students.
A one-way ANOVA was used to calculate whether age had an effect on rhythm achievement of first, second, and third grade students (see Table 10). Results showed that there were no significant interactions between any of the grades or assessments. There was a significant main effect for age and the triple meter-label test achievement ($SS = 31.841$, $df (2)$, $MS = 15.921$, $F = 6.377$, $p = .002$), and for age and
composite meter-label test achievement ($SS = 59.048$, $df (2)$, $MS = 29.524$, $F = 4.908$, $p = .008$). Third grade students’ mean scores confirmed that they performed better than first and second grade students on the triple and composite meter-label achievement tests. Second grade performed better than first grade on the triple and composite meter-label achievement tests.
Table 10

_One-Way Analysis of Variance for Rhythm Achievement and Age_

<table>
<thead>
<tr>
<th>Task</th>
<th>Source of Variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duple Oral</td>
<td>Between Groups</td>
<td>31.077</td>
<td>2</td>
<td>15.538</td>
<td>1.516</td>
<td>0.222</td>
</tr>
<tr>
<td></td>
<td>Within Groups</td>
<td>1844.434</td>
<td>180</td>
<td>10.247</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1875.511</td>
<td>182</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triple Oral</td>
<td>Between Groups</td>
<td>1.967</td>
<td>2</td>
<td>0.984</td>
<td>0.109</td>
<td>0.897</td>
</tr>
<tr>
<td></td>
<td>Within Groups</td>
<td>1623.431</td>
<td>180</td>
<td>9.019</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1625.398</td>
<td>182</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Composite Oral</td>
<td>Between Groups</td>
<td>43.898</td>
<td>2</td>
<td>21.949</td>
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*p < .05

Summary

The results of this study revealed that there is no relationship between rhythm music aptitude and rhythm achievement as expressed through improvisation.
and aural identification of meter when rhythm pattern instruction was part of the curriculum. A moderate relationship was found between third grade students’ duple meter-label and triple meter-label achievement. Age had an effect on achievement for triple meter-label and composite meter-label scores. The results, statistically significant or not, provide insight into the purpose and problems of this study and provoke conclusions, implications for music education, and suggestions for further research.
Chapter 5

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

Many researchers and teachers have focused on rhythmic concepts such as (a) rhythmic reading (Colley, 1987; Palmer, 1976; Shehan, 1987), (b) sense of meter (Jones, 1976, 1992), (c) beat competency (Groves, 1969; Rainbow, 1981; Schleuter & Schleuter, 1989), and (d) comprehending rhythm patterns (Bennett, 1991; Gardner, 1971; Persellin, 1992; Wolf, 2004) as a way to assess rhythmic achievement. The researchers have attempted to define the most effective avenue for teaching rhythmic competency. The conclusions from these studies do not show a consistent outcome. If students are not audiating rhythmically, they may not have a full comprehension of notation and beat function. One belief regarding the understanding of rhythm is through movement, the audiation of body movement, and the audiation of rhythm patterns (Gordon, 2003). Through a review of literature, it is clear that there is minimal to no research on the effects of audiation-based instructional practices on students’ rhythmic achievement and developmental rhythm music aptitude. Therefore, a need to conduct research on rhythm music aptitude and its relationship to rhythmic achievement through rhythm pattern instruction among elementary students was presented.
Summary

The purpose of this study was to examine the effect of an audiation-based curriculum on rhythmic music aptitude and rhythm achievement of elementary school students. Specific research questions addressed were: (a) Is there a relationship between developmental rhythm music aptitude as measured by Primary Measures of Music Audiation (PMMA) (Gordon, 1986b) and rhythm achievement of first, second, and third grade students? (b) Does the relationship between developmental rhythm music aptitude and rhythm achievement change with age? and (c) Does age have an effect on rhythm achievement?

Sixty-one first grade students, 77 second grade students, and 45 third grade students from a suburban elementary school located in the mid-Atlantic seaboard of the United States participated in this study. The 10 intact classes involved in the study were those, which coincided with each other, so that each homeroom involved had the same amount of music classes and exposure. Participants met for 45 minutes each week, for five months.

During the beginning of each class period, all of the participants engaged in 5 to 10 minutes of formal rhythm pattern instruction using Gordon’s LSAs (2001a), which assisted in the development of rhythmic audiation. Pattern instruction alternated each week between duple meter and triple meter patterns. The remaining time in class was devoted to instruction that focused on tonal and rhythm audiation, such as audiation of the resting tone, and rhythm passages. Other concepts were part of the
lessons such as the development of beat competency, movement, rhythmic improvisation, correct use of the singing voice, and the use of pitched and un-pitched instruments. Improvisation activities were included in almost all of the lessons. These activities allowed the students to bridge to a higher level of music learning through spontaneously audiating and performing rhythmic patterns in duple and triple meters.

All participants of the study completed three rhythmic achievement tasks over a two-week period during the second and third weeks of May. The tasks were: (a) improvise a four-beat pattern in duple meter on neutral syllables, (b) improvise a four beat pattern in triple meter on neutral syllables, and (c) identify duple or triple meter through an aurally based written labeling test. Each student’s oral response was audio-recorded using an iPod recorder. Two independent judges, using a 5-point continuous rating scale, scored the improvised rhythm patterns for the oral assessments. The teacher-researcher scored the meter-label test. The PMMA posttest was used to measure the developmental rhythm music aptitude of all of the participants.

Descriptive statistics of means and standard deviations were calculated for each dimension of the rhythmic assessments (oral duple, oral triple, written duple label, written triple label), including composite achievement scores and PMMA scores. Pearson product-moment correlations confirmed very strong interjudge reliabilities for the oral rhythm pattern improvisations. Pearson product-moment correlations were utilized to examine the relationships between students’ rhythm music aptitude and the individual rhythmic music achievement task scores, including
composite scores, and to determine whether the relationship of rhythm music aptitude and rhythmic achievement changed with age. A one-way ANOVA was used to determine whether age had an effect on rhythm achievement.

**Results**

The interjudge reliability for the oral rhythm achievement rating scale was very strong. The high interjudge reliability was due to a strong understanding of the rating scale and its dimensions. The reliability with duple meter was slightly higher than triple meter for each grade. This may be indicative of the inherent nature of duple meter within the Western civilization.

No significant relationship between developmental rhythm music aptitude and rhythm achievement was found for the students who participated in this study (N = 183). Yet, developmental music aptitude was found to increase with age. Though already weak, the relationship between developmental rhythm music aptitude and rhythm achievement decreased with age. Mean scores demonstrated one important trend that age had an effect on the capability for students to identify triple meter, and meter overall through a written labeling task.

**Conclusions**

Based upon the results of this study, no relationship was found between developmental rhythm music aptitude and rhythm achievement. The two constructs may not be related, which complements Gordon’s (2003) theory of music learning.
Music aptitude is the potential to achieve in music. Music achievement is the outcome from what one has been exposed to and has learned; therefore, the amount and type of instruction influences a person’s level of achievement. This conclusion is consistent with Mota (1997) who examined the relationship between music aptitude and three music achievement tasks among six-year-olds. She concluded that there is not a significant relationship between music aptitude and music achievement tasks, such as singing or playing a rhythm pattern on an instrument. Rutkowski’s (1996) investigation of Kindergartener’s use of singing voice and developmental music aptitude within an individual or small group setting resulted in no significant relationship between singing voice and developmental tonal music aptitude. Hornbach and Taggart (2005) examined the relationship between singing achievement and developmental tonal music aptitude of first, second, and third grade students and found no meaningful relationships. They concluded that singing voice and developmental tonal music aptitude were independent constructs.

The current study indicates that rhythm achievement is independent of developmental music aptitude. This may be due to PMMA being a discrimination test. During the administration of the music aptitude test, students listened and circled a response to determine if they were audiating same or different rhythm patterns. In class rhythm pattern instruction included the audiation, imitation, and improvisation of patterns by physically chanting a same or different response. The physical chanting of patterns each week may have made the patterns accessible for the students’ rhythm
improvisation, yet, unrelated to discriminating same or different rhythm responses through audiation on a music aptitude test. Research to support this hypothesis comes from Feierabend and Saunders (1998) who examined the relationship between the ability to discriminate aurally between tonal patterns and the ability to orally perform the same tonal patterns. Their study helped to discern the lack of relationship between pattern instruction and developmental music aptitude. A weak relationship occurred when correlating students’ scores on an aural discrimination test and their ability to reproduce patterns orally. Feierabend and Saunders (1998) concluded that aural discrimination and oral performance might be independent abilities.

As age increased, the relationship between developmental rhythm music aptitude and rhythm achievement decreased. This result is supported by Gordon’s work on music aptitude (2003). As a child nears stabilized music aptitude, at approximately nine years old (Gordon, 2003), instruction has less of an effect on the development of audiation. Another reason why the relationship between developmental rhythm music aptitude and rhythm achievement decreased as age increased could have been due to environmental factors. Whereas the third grade students did very well on the music aptitude test, when it came time to demonstrate rhythmic achievement in class, their scores were not as high. Environmental factors may have played a part in these results. The class may have had a bad day in school, or perhaps the class just took a test in their homeroom prior to coming to music class.
In addition, the students may have felt inhibited toward performing the rhythm patterns in front of their peers.

Age did not have a consistent effect on rhythm achievement scores. Second grade performed better than first grade on the triple and composite meter-label achievement test, but not on the duple meter-label portion. First grade scored better than second grade on the duple meter-label achievement task. The inconsistencies may be due to the possibility of issues with social development and not musical development.

One reason as to why age did not have a consistent effect on rhythm achievement scores may be due to the way students responded to the improvisation rhythm pattern achievement task. Students responded orally for the improvisation rhythm pattern achievement tasks in front of each other. This method is regularly used in the teacher-researcher’s classroom, so students would have been familiar to the concept of chanting a pattern alone, in front of the other students. LSAs (Gordon, 2001a & 2001b) are an authentic method to formal pattern instruction, which aligned with the mode of the teacher-researcher’s music instruction. However, some of the students may have imitated a pattern or similar pattern to that of a peer, which may have been incorrect. Researchers such as Hornbach and Taggart (2005), Persellin (1992), Reinhardt (1990), Shehan (1987), and Velez (2009) all tested the students individually or in a small group in a separate room. Using this model might have helped the students give more authentic responses.
Age had an effect on students’ ability to label meter, specifically triple meter. As students gained experience with meter, they were better able to aurally identify and label the meter, as compared to orally chanting a rhythmic pattern. Curriculum exposure might have played a part in this result. Third grade students, though it was their first year experiencing LSAs, had been exposed to a curriculum that engaged them in informal aural and oral pattern instruction for two years prior to this study. Second grade students had informal instruction for one year. The audiating of patterns, songs, and chants, performed by the teacher-researcher, for a prolonged period of time may have helped the second and third grade students identify meter on the written label test.

The conclusions from the current study as well as those discussed from other research investigations indicate that more research needs to be conducted in the area of rhythm pattern instruction, rhythm achievement, and developmental rhythm music aptitude.

**Suggestions for Future Research**

The following recommendations address the need for further investigation regarding the effect of an audiation-based curriculum on rhythmic music aptitude and rhythm achievement of elementary school students.

A replication of this study might be conducted for a longer period of time and include mid- and posttest achievement tasks for each year of a study, over the
course of a few years. Extending a study for a longer period of time may uncover more information, due to the developmental nature of musicality in children. Brophy (2005), Mota (1997), and Rainbow (1981) each performed their research over a three-year period. Brophy inspected the melodic improvisations of students, ages seven, eight, and nine. Mota examined a group of students from the age of six until they completed third grade. PMMA was used as a pretest and the achievement assessments were focused on both tonal and rhythmic tasks. Rainbow investigated the rhythmic abilities of Preschool children by examining 14 different rhythmic tasks. Rainbow (1981) concluded that children’s progress in learning and performing rhythmic tasks is very slow. None of these studies used pattern instruction as part of formal music instruction. A longitudinal investigation might help researchers and teachers to understand the long-term effects of this particular method. Rhythm pattern instruction in conjunction with PMMA may illuminate whether there is a relationship between music aptitude and music achievement when pattern instruction is part of formal music instruction over a prolonged period of time. Additionally, music achievement gains might be found when observing children’s musical growth over time.

The current study involved all participants in a curriculum where formal rhythm pattern instruction was part of every lesson. A future study might use an experimental design to measure the effects of rhythmic tasks, such as rhythm improvisation. Velez (2009) investigated the effect of tonal pattern instruction on the tonal cohesiveness of vocal improvisations and developmental tonal music aptitude of
first and second grade students. Her results between the control and experimental
groups demonstrated higher mean scores overall for students who received formal
tonal pattern instruction. As age increases and the same curriculum focusing on
audiation transpires, a relationship between rhythmic improvisation with rhythm
achievement or age may be found to exist.

Developmental rhythm music aptitude and composite rhythm achievement
did not reveal a meaningful relationship. This may be that there is no direct
relationship between music achievement and developmental music aptitude. “Music
aptitude is a measure of a student’s potential to learn music. Music achievement is a
measure of what a student has already learned in music” (Gordon, 2003, p. 41). Future
studies could be created to examine rhythm achievement, such as rhythm
improvisation, and developmental rhythm music aptitude by the aptitude level of the
students. Comparisons could be drawn between the scores of the high, moderate, and
low aptitude students with their ability to improvise rhythmically. This type of study
may reveal significant differences between aptitude groups, or relationships between
rhythm improvisation and developmental rhythm music aptitude that may be
undetected in a whole group evaluation.

Palmer (1976) investigated two different approaches to rhythm reading.
She examined the effects among the Kodály system, Gordon’s beat function method,
and a control group. Gordon’s Musical Aptitude Profile (MAP) (MAP, 1988) was
used to determine the students’ musical aptitude. Results showed a high correlation
between the MAP scores and the written rhythm reading achievement posttest scores. Significant gains in overall rhythm achievement occurred in the experimental groups compared to the control group. This suggests that a future study involving different methods for teaching rhythm concepts, such as improvisation, may help aid teachers in deciding the best method for their students.

All of these suggestions emphasize the need for more research on rhythm music aptitude, rhythm pattern instruction, and rhythm achievement and their role in the instruction of rhythmic concepts and skills with children.

Implications for Music Education

Music aptitude was found to increase with age. Students’ prior participation in an audiation-based curriculum may be the underlying support for this conclusion. Therefore, music educators should consider engaging their students in audiation-based instruction.

The application of a music curriculum over multiple years that concentrates on the development of rhythmic skills, through formal pattern instruction, physically using macrobeats and microbeats in duple, triple, and unusual meters, identifying the meter of a given tune or chant, and improvising rhythm patterns may have an effect upon students’ developmental rhythm music aptitude.

As students gained experience with triple meter, they were more able to identify triple meter, and meter overall. Formal pattern instruction was not part of the
teacher-researcher’s music instruction until the application of the current study; however, students in second and third grades had prior participation in a curriculum that emphasized many of the same skills and concepts. The use of such a curriculum over a prolonged period of time could explain why older students were more successful at identifying meter than younger students. Music educators should expose students to other meters early and often and have students physically demonstrate macrobeats and microbeats during classroom instruction.

A concentration on the development of students’ rhythm achievement through rhythm improvisation should be an integral part of a music teacher’s curriculum. LSAs are a means for music teachers to differentiate their instruction. Pattern imitation and improvisation provides students with opportunities for individual musical expression and achievement based on their music aptitude and allows students to feel a sense of ownership for their musical success. Providing multiple opportunities for students to imitate and improvise rhythm patterns in front of their peers provides opportunities for individual assessment, while helping students become more comfortable and confident when giving a musical response.

There is a need for more research in the area of rhythm achievement, particularly when formal rhythm pattern instruction is part of the music curriculum. With a more comprehensive awareness of whether oral rhythm pattern instruction causes achievement in rhythmic skills and achievement in rhythmic improvisation, and an understanding of how music aptitude impacts the development of these skills,
music educators will be able to create a more inclusive and suitable method for teaching rhythmic concepts and skills to enable all students’ musical success.
APPENDIX A

HUMAN SUBJECTS PROTOCOL
University of Delaware

Protocol Title: Rhythm Aptitude and Achievement Development

Principal Investigator
Name: Kelly Harding
Contact Phone Number: 302-449-1890
Email address: kharding43@hotmail.com or kharding@udel.edu

Advisor (if student PI):
Name: Dr. Suzanne Burton
Contact Phone Number: 302-831-0390
Email address: siburton@udel.edu

Other investigators:

Type of review: Exempt Expedited Full board

Exemption Category:

Minimal Risk: yes no

Submission Date:

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Investigator Assurance:
By submitting this protocol, I acknowledge that this project will be conducted in strict accordance with the procedures described. I will not make any modifications to this protocol without prior approval by the HSRB. Should any unanticipated problems involving risk to subjects, including breaches of guaranteed confidentiality occur during this project, I will report such events to the Chair, Human Subjects Review Board immediately.

Signature of Investigator: Kelly Harding

Date: 11/10/08
RSA-F002-02: Research Proposal Review Form

Name of Researcher: Kelly Harding

Project Title: A Study on Rhythm Musical Aptitude and Achievement
Reviewer: Linda Ochenrider Date distributed: December 3, 2008

Please circle Yes, No, or Unsure. (Unsure/not applicable) under each criteria. For additional comments, please use the back of this form.

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If disapproving this request, please list your primary reason(s) for doing so:

Please return completed form to Pamela Stazesky, Accountability and Assessment, within 10 days of date distributed.
Part IV: Required Attachments

☐ Research Description (including the purpose, research design and methodology, detailed protocol for data collection, plan for analyzing the data, and expected benefit to the school district)

☐ Copy of informed consent/assent forms, all data collection instruments (e.g. surveys, tests, observation protocols) and the informational letter that will be sent to the participants describing the study

Please read each of the following statements and place a check mark in the box indicating your agreement to abide by each of the following statements.

☐ I will comply with all statutes, rules, and regulations applicable to conducting research including the Federal Family Rights and Privacy Act. I will abide by all of the policies and regulations of the Christina School District and will conduct this research with the stipulations accompanying any letter of approval.

☐ I will request approval for any changes or additions made to data collection instruments that are not formatting or editing related after receiving approval. The research and use of data will be consistent with the approved research design. No further uses of this data will be permitted without additional written permission from the Office of Accountability and Assessment.

☐ I acknowledge that participation in research by students, parents, and school staff is voluntary. I will preserve the anonymity of all participants in all reporting of this study. I will not reveal the identity or include identifiable characteristics of schools or the school district unless authorized by the Senior Administrator of Accountability and Assessment.

☐ I will notify the Office of Accountability and Assessment immediately if my status as principal investigator changes.

☐ At the completion of the study, I will provide the Office of Accountability and Assessment in the Christina School District with a copy of the results.

[Signature of Researcher/Principal Investigator] / 11/10/08

[Signature of Approver (CSD employees only)] / 11/13/08

[Signature of Advisor (graduate students only)] / 11/03/08

Please mail or fax requested material to:

Pamela B. Stazesky, Senior Administrator
Accountability and Assessment
Christina School District
600 N. Lombard Street
Wilmington, DE 19801
(302) 552-2702 (voice)
(302) 429-4109 (fax)

Christina School District • 600 North Lombard Street • Wilmington, Delaware 19801 • 302-552-2600
Dear Parent(s)/Guardian(s),

This school year, I am completing my Master’s Thesis in Music Education at the University of Delaware. I would like to tell you about the music research project that I will be conducting in my classroom for my thesis.

For the research study, I am interested in learning about student achievement in rhythm. I will be looking at whether there is a difference in achievement based on different instructional techniques used when teaching rhythm to students in grades 1st through 3rd. During this 6 month study, I will provide students with a variety of experiences in music using different styles of instruction. There will be an emphasis on rhythmic concepts. I will audiotape your child from time to time during their regular music class to capture their vocal rhythmic chants for subsequent analysis. What I learn from this study could help me and other music teachers learn which types of instructional materials and concepts help stimulate student learning. Student names will be kept confidential and will not be linked to the results of the research project. I look forward to conducting my research project in my classroom. If you have any questions, you may contact me at 454-2103 ext. 405.

Sincerely,

Kelly Harding
Leasure Elementary General Music Teacher
APPENDIX C
APPENDIX C

RHYTHM UNIT 2  SECTION B  CRITERION 1

Grade _____ Teacher ______________ Date ______ Test _____

Chant rhythm sequence in usual duple using rhythm syllables.
Chant class patterns in usual duple using rhythm syllables.

Teacher chants patterns using rhythm syllables.
Students chant patterns using rhythm syllables.

Usual duple  E  M  D

Seating/Evaluation Chart
RHYTHM UNIT 2  SECTION C  CRITERION 1

Grade _____ Teacher __________ Date _______ Test _____

Chant rhythm sequence in usual triple using rhythm syllables.
Chant class patterns in usual triple using rhythm syllables.

Teacher chants patterns using rhythm syllables.
Students chant patterns using rhythm syllables.

Usual triple

E

M

D

Seating/Evaluation Chart
APPENDIX D
APPENDIX D

Primary Measures of Music Audiation Rhythm Subtest
APPENDIX E

Rhythm Improvisation Achievement 5-Point Continuous Rating Scale

5-- Student chants rhythm pattern with a steady beat, in meter, and in tempo.

4-- Student chants rhythm pattern with a steady beat, in meter, but not in tempo.
   (comes in late)

3-- Student chants rhythm pattern with a steady beat, in tempo, but in a different meter.

2-- Student chants rhythm pattern in tempo, but lacks a steady beat, sense of meter.

1-- Student chants, but lacks a steady beat, sense of meter and tempo.

0-- Student does not respond or echoes the same pattern given by the teacher.
APPENDIX F

Written Meter-Label Test Oral Patterns

1. \(\frac{4}{4}\)

2. \(\frac{6}{8}\)

3. \(\frac{4}{4}\)

4. \(\frac{4}{4}\)

5. \(\frac{8}{8}\)

6. \(\frac{4}{4}\)
APPENDIX G
APPENDIX G

Written Meter-Label Student Test

NAME _______________________________   HOMEROOM # ___________

Example:   DUPLE   TRIPLE

1. DUPLE   TRIPLE

2. DUPLE   TRIPLE

3. DUPLE   TRIPLE

4. DUPLE   TRIPLE

5. DUPLE   TRIPLE

118
6. DUBLE       TRIPLE
7. DUBLE       TRIPLE
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REFERENCES


Burton, S. L. *5-point continuous rating scale for rhythm pattern improvisation.* Personal communication, 2008.


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