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The effect of background music on second-grade children's rhythmic and tonal pattern recognition

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THE EFFECT OF BACKGROUND MUSIC ON SECOND-GRADE CHILDREN'S RHYTHMIC AND TONAL PATTERN RECOGNITION

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ABSTRACT

The purpose of this study was to examine the effects of background music on second-grade students' rhythmic and tonal pattern recognition. As no locatable research has examined the effects of passive listening on the tonal and rhythmic pattern recognition skills of second-grade students, this investigation sought to answer the following research questions: 1) What is the extent of the relationship between exposure to repetitive background music and music pattern recognition scores among second-grade children; and 2) What is the extent of the relationship between musical preference and music pattern recognition scores among second-grade children?

This study was conducted over a period of fourteen weeks. Sixty second-grade students comprised the sample used in this investigation. The participants were randomly assigned to one of two groups: the treatment group, which heard a continuous collection of classical background music every day for a total of sixty minutes per day, five days per week, and the control group, which received no treatment. The standardized test employed in this study was Edwin Gordon's *Primary Measures of Music Audiation* (*PMMA*), intended for children from kindergarten to grade 3. Additionally, a survey

addressing the issue of preference was distributed at the end of the fourteen weeks to the students in the treatment group. All participants were administered the *PMMA* at the end of the fourteen-week testing period.

The data gathered in this investigation were analyzed via a two-way Repeated Measures ANOVA. Analysis of the *PMMA* scores revealed statistically significant differences between the control group and the treatment group in the subset of participants with low-to-average music aptitude on the rhythm test. Statistically significant differences were also found between the composite percentile, rhythm raw and rhythm percentile scores of those participants in the treatment group who liked the music versus those who disliked the music. The significant results of this study include: a) those participants who possessed low-to-average music aptitude benefited from the background music program in the area of rhythmic discriminatory skills; and b) those participants who liked the music performed better on the rhythm test of the *PMMA* than did those participants who disliked the music.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter One

Introduction

Background music may be defined as "...any music played while the 'listeners' are primarily engaged in some task or activity other than listening to the music" (Radocy & Boyle, 1988, pp. 271-272). It is omnipresent in today's society, and it permeates the fabric of most cultures. Its effects are felt in all fields from education to healing therapy, and background music impacts anyone who has ever watched television, walked through a grocery store, flown on an airplane, or stepped onto an elevator (Brown & Volgsten, 2006). The power and purpose of background music often differs with each listener and the activity in which each listener is involved (Furnham & Allass, 1999; Furnham & Strbac, 2002). Current research abounds on the persuasive powers of background music on all conditions from behavioral modification to consumer-purchase manipulation to cross-curriculum cognitive enhancement (Brown & Volgsten, 2006).

With the advent of electronically reproduced music, background music has become even more prevalent in our society, resulting in a sizeable increase in personal and educational usage. Teenagers report listening to music approximately three hours per day, and they often listen to background music or the television while doing their homework (Adriano, 2010). Parents are using modern media to advantage as well. When the initial results of the 'Mozart effect' (Rauscher, Shaw & Ky, 1993) were first published, the public responded with multi-million-dollar interest. So convinced was Georgia State Governor Zell Miller of the power of the Mozart effect that in 1998 he allocated $105,000 to supply classical music compact discs (CDs) to the parents of every

child born in the state of Georgia (Demorest & Morrison, 2000). On the *Today* show in 2005, former schoolteacher Julie Aigner-Clark (2011) described her journey from modest schoolteacher to millionaire after creating a video in her basement called *Baby Mozart* to entertain her own newborn. The public response was so compelling that Aigner-Clark subsequently produced a series of *Baby Einstein* CDs and videos that reportedly catapulted her business into multi-million-dollar earnings (Aigner-Clark, 2007).

The Mozart effect was popularly misinterpreted as an increase in overall intelligence as a result of idle listening to the music of Mozart. Actually, the reported effect only referred to brief, temporary enhancements of spatial-temporal reasoning after ten minutes of focused listening, and this reported increase in spatial-temporal reasoning was only evident for a short duration (Rauscher et al., 1993). The Mozart effect was both praised and subsequently vilified for its claims (Rauscher & Shaw, 1998; Steele, Bass & Crook, 1999), but the phenomenon continues to entice teachers to experiment with background music in their classrooms in the hope that it may provide cognitive, behavioral and social effects (Hargreaves, MacDonald & Miell, 2005).

There are currently three lines of research exploring potential intellectual and cognitive benefits of music (Črnčec, Wilson & Prior, 2006). The first area of research is the connection between actively listening to music and performance of the subsequent task. One has only to perform an internet search on music ideas for the classroom to find that music is often played in elementary school classrooms with the idea that music can stimulate attention and learning. In fact, several studies have been conducted on the effects of focused music listening on the characteristics of tempo, mode and dynamic of

background music on cognitive learning, task performance, memory, physical response and crossover benefits, as well as mood and behavior (Anderson & Fuller, 2010; Eady & Wilson, 2004; Foran, 2009; Gromko, Hansen, Tortora, Higgins, & Boccia., 2009; Koppelman & Imig., 1995; Paquette & Rieg, 2008; Rauscher & Shaw, 1998; Seda, 2009; Southgate & Roscigno, 2009; Thompson, Schellenberg & Husain, 2001; Woody, 2004). In a study based on Rauscher's experiment, Thompson et al. (2001) concluded that the Mozart effect was nothing more than a manifestation of the well-documented effects of music on mood and arousal. The state of mind induced by listening to music can encourage a sense of calm and relaxation while improving attention and focus.

The second area of research is the impact of direct music instruction on cognitive function (Črnčec et al., 2006). Much has been written about the effects of the formal study of music on all areas of learning and life. The National Association for Music Education (NAfME) cites a plethora of research on its website in support of the position that studying music in school is associated with student achievement in academics and in life (NAfME, 2007), and NAfME encourages teachers and parents to nurture an interest in music in children. Research in this area has generated the most persuasive empirical evidence (see, for example, Schellenberg, 2004, 2006; Southgate & Roscigno, 2009; Standley, 2008).

The third area of research is that of background music listening (Črnčec et al., 2006). Music that is chosen with care can create a pleasant and positive learning environment (Giles, 1991). Not all classroom teachers make claims on the effects of background music in support of cognitive gains, yet as McGovern (2000) notes, many

classroom teachers still identify several successful uses of music in the classroom intended to facilitate transitions, relax students, improve the classroom atmosphere, and engage students in the learning process. Studies abound on the unconscious power of indirect listening to background music on learning, behavior, mood and arousal, and cognitive performance, suggesting that passive listening to background music may influence in a variety of ways (Adriano, 2010; Chalmers, Olson, & Zurkowski, 1999; Davidson & Powell, 1986; Furnham et al., 1999; Giles, 1991; Hallam & Price, 1998; Hallam, Price & Katsarou, 2002; McGovern, 2000; Savan, 1999; Seda, 2009; Waugh, 2007; Webster, 2005). The findings for a link between background music and superior task performance, however, remain inconsistent (Črnčec et al., 2006). The most persuasive rationale to date for playing background music in the school setting is for its calming effect. Educators routinely report a reduction in unruly and inattentive behavior in response to the introduction of soothing background music into the classroom environment (McGovern, 2000).

Since the earliest studies were conducted on the cognitive effects of background music in the 1930s and 1940s (Hallam et al., 2002; Koppelman et. al, 1995), results have been mixed. One major finding, however, is that different styles of music can generate different effects. Music can be distracting as well as soothing, depending on the listener, and personal preferences can influence whether individuals find background music enjoyable or unpleasant. The impact of a listener's personality traits on music preference and individual response to background sound is a neglected but potentially revealing area

of research for utilizing music in the educational setting (Furnham & Allass, 1999; Furnham & Strbac, 2002).

With so much research available investigating the effects of background music on performance in language, math and spatial abilities (Anderson et al., 2010; Hallam et al., 2002; Koppelman et al., 1995; Rauscher et al., 1993; Savan, 1999), an examination of the research surprisingly reveals a deficiency of studies examining the effects of background music on children's music aptitude, and specifically on rhythmic and tonal pattern recognition. The shortage of empirical investigations in the extant literature is the basis for the current investigation.

Purpose

The purpose of this study was to determine the extent to which selections of repetitive background music affect rhythmic and tonal pattern recognition in second-grade students. The study explores the degree to which, if any, regularly listening to background music would activate aural pattern recognition, thereby improving rhythmic and tonal discriminatory abilities. Changes in music aptitude were measured using Gordon's (1979) *Primary Measures of Music Audiation (PMMA),* which is a standardized test of music aptitude intended for use with students in kindergarten through grade three who are typically five through eight years of age. Secondarily, because existing research indicated that children's music preferences may influence their response to music (Chamorro-Premuzic, Swami, Furnham & Allass, 1999; Furnham & Strbac, 2002), this study also explored the connection between the participants' musical preferences and scores on rhythmic and tonal pattern recognition and recall. This study is important

because it speaks to the issue of how background music might support musical development.

As previously noted, there are few studies in the research literature addressing the influence of background music on music aptitude; however, there is a growing body of literature that would seem to suggest potential interest in the topic (Elliott, 1995; Kwiatkowski, 2001). With the burgeoning data suggesting a relationship between active music listening and musical learning, studies examining the relationship between passive music listening and music ability bear addressing.

Research Questions

The research questions that guided this investigation are as follows:

1. What is the extent of the relationship between exposure to repetitive background music and music pattern recognition scores among second-grade children?
2. What is the extent of the relationship between musical preference and music pattern recognition scores among second-grade children?

Rationale

Music listening involves the perception of patterns in aural data. According to Radocy and Boyle (1998), the unconscious synthesis of pattern data is the way the human brain assimilates musical and non-musical information. Sloboda (1985) also posited that the human brain translates all data into patterns, and maintains that data grouping is the way we learn. This premise has been used to advantage in every aspect of elementary classroom learning, from repetition of sight words, vowel patterns, consonant blends and

word families in reading and spelling (Slingerland, 2008) to pattern recognition and fact families in addition, subtraction, multiplication and division (Burns, 1991).

The positive effects of music listening on musical learning are thought to be predicated on the listener's ability to recognize and retain musical patterns (Campbell, 2005). Even when data are not presented in recognizable patterns, the listener still attempts to group the material in patterns for the purpose of recall. Gordon (1979) maintained that the cultivation of pattern-recognition abilities is key in the acquisition of certain long-term musical skills. Suzuki (1998) proposed that through the "Law of ability and the mother tongue method" (p.19), children learn through a systematic practice of repetition by which they are able to improve their inherent pattern-processing abilities. Kodály emphasized the importance of sequential learning, and presented on the Kodály website for music educators are the key elements of the approach. Kodály educators maintain that only after skills and concepts are mastered through repetition should a student proceed to the next step ("Organization of American Kodály Educators," 2012). Gordon (1979, 1982, 2011) also emphasized the value of repetitive listening exercises, but by contrast, taught specific musical patterns to students first that later could be identified in a range of music selections. Gordon tested his theories via a series of music aptitude tests he created, and posited that for children under the age of nine, music listening correlates with music aptitude (1986).

The current investigation was modeled after two previous investigations of the effects of background music on music aptitude (see Elliott, 1995; Kwiatkowski, 2001). Neither Elliott nor Kwiatkowski were able to establish a relationship of any statistical

significance between background music and music aptitude in pre-grade-school children. Many theories were presented by the researchers in an attempt to explain their results, including the possibility that the subjects of their investigations were too young, and that the background music chosen for their studies should have been modified.

The current study will respond to both issues. First, based on the merits of the research indicating that the second grade is a critical juncture in the development of a child (Gardner, 1994; Glover, 2000; Gordon, 1981), the current study will focus on second-grade children instead of pre-grade-school children, as was the case in both the Elliott and Kwiatkowski studies. Second, regarding the issue of the selections of background music, both Elliott and Kwiatkowski expressed concerns about their choices. Elliott's choice of music, while diverse, included fourteen tapes of selections too lengthy to ensure that the listeners were exposed to the widest variety of musical elements possible in a single listening session. Since the premise of the Elliott study was that the absorption of repeated musical patterns would contribute to the growth of music aptitude, the music selections needed to be short enough to repeat with regularity for the subjects to reap the benefits. In the case of the Kwiatkowski study, the music selections were chosen exclusively from the works of Bach. While the patterns may have repeated sufficiently for multiple hearings, the lack of diversity in the selections fell short of the recommendations noted in the research (Gordon, 1991; Suzuki, 1998).

The series of background music tapes published by Gordon (1991) entitled *Jump Right In To Listening: Music For Young Children* (1991) were chosen for the current study because Gordon indicated that he designed the collection to maximize the variety

of elements in the music by offering brief excerpts, all less than three minutes in length. These excerpts include a wide range of musical elements, including genres, dynamics, tempi, instrumentation, and rhythmic and melodic variations. According to Gordon, the brevity of music selections ensured that participants were exposed to multiple repetitions of the tonal and rhythmic patterns in the background music.

Many researchers have noted that a significant part of musical learning is acquired without formal study (Fiske, 1997; Lerdahl & Jackendoff, 1983; "Suzuki Association," 2014); in fact, the research indicated that children acquire knowledge of the elements of music indirectly through informal exposure (Schellenberg 2005; Schellenberg & Trehub, 1996). While the phenomenon of the Mozart effect prompted a surge of studies in recent years on the effects of background music on all areas of behavior and learning, the area of background music on musical learning still demands attention. Forgeard, Winner, Norton & Schlaug (2008), Kwiatkowski (2001) and Murphy (1999) cite a growing interest on the effects of background music on musical development. Further, as previously noted, the existing body of research supports the premise that children's music preferences may influence their responses to background music (Chamorro-Premuzic et al., 1999; Furnham & Strbac, 2002). Therefore, a study assessing the effects of repetitive background music and music preference on tonal and rhythmic pattern recognition might shed light on the value of a background music program on musical learning and development.

Methodology

This study involved second-grade students (N=60) from an elementary school in Connecticut. Since the subjects attended the same school, they shared similar musical education background and experiences; further, at seven and eight years of age, almost all subjects had received two school years of similar school music training. This addresses past research concerns indicating that young subjects may need some prior music experience through which they might frame their listening experience (Elliott, 1995; Kwiatkowski, 2001). In consideration of the research indicating that seven years of age may be an optimal time in the development of music ability in a child (Gardner, 1994; Glover, 2000; Gordon, 1981), the average age range of participants chosen for this study was between seven and eight years.

Two control groups and two experimental groups were selected from four existing second-grade classes. Each of the classes were randomly assigned to one of two groups: the two classes assigned to the experimental group heard a continuous, repetitive collection of short background music samples containing a variety of genres, dynamics, tempi, instrumentation, and rhythmic and melodic variations as suggested by the research to be the most effective choice in supporting the absorption of musical elements (Gordon, 1991; Suzuki, 1998), and the two classes assigned to the control group received no treatment, i.e., no background music. All sixty students were assessed with standardized tests prior to the treatment phase of the project. The standardized test employed in this study was Edwin Gordon's *Primary Measures of Music Audiation* test (*PMMA*), intended for children from kindergarten to grade three. For the students in the treatment group,

background music was played every morning at the beginning of the school day for thirty minutes while students made preparations for their day with morning chores, and at the end of every afternoon for thirty minutes while students prepared for dismissal, for a total of sixty minutes per day, five days per week, for the course of fourteen weeks. The designation of sixty minutes per day for five days per week is equivalent to that of the Kwiatkowki study (2001), and the maximum amount of time feasibly possible as reported by classroom teachers to allocate to the playing of background music for an experiment of this length of time without disruption to the academic instruction schedule. Concerns raised by the teachers that background music might interfere with academic learning in some children are supported by the research (Furnham & Allass, 1999; Furnham & Strbac, 2002), suggesting that the performance of introverts on cognitive tasks is negatively impacted by distracters such as background music.

The two previously mentioned experiments that produced no main effect administered a treatment length of four weeks (Kwiatkowski, 2001) and fourteen weeks (Elliott, 1995). The current research project was originally designed to build upon these studies by extending the treatment period to a point beyond fourteen weeks to allow for more time for a possible main effect to emerge. Due to events beyond the control of the researcher, this was not possible. The timeframe of the current study, therefore, was fourteen weeks, which is equivalent to that of the Elliott study. As such, the current research should be considered comparable to the Elliott study with respect to time. It should be noted that the timeframe of fourteen weeks also exceeds Gordon's minimum recommendation of one month between administrations of the musical aptitude tests.

The current body of literature on the subject of children's music preferences seems to indicate that children's responses to background music may be influenced by their preference or aversion to music (Chamorro-Premuzic et al., 1999; Furnham & Strbac, 2002); as such, a researcher-designed Music Preference Questionnaire (MPQ) was administered to all participants of the treatment group after the experiment was completed to determine student response to the music that was played. The data were compared with posttest composite scores to investigate the possibility that music preference is associated with rhythmic and tonal pattern recognition and recall.

A two-way Repeated Measures Analysis of Variance (ANOVA) was employed to determine if there was a significant difference in composite posttest scores between the participants of the control groups versus the experimental groups, as well as a significant difference in the posttest scores between the two groups based on the results of the MPQ.

Delimitations

Due to the standard configuration of the elementary school learning environment, this study utilized intact classes for assignment to the experimental and control groups. Second, the study took place at a single elementary school as a function of the researcher's ease of access. Third, the focus of this study was limited to the interaction between the elements of music aptitude and preference of music only. This study did not address issues of socioeconomic status, intelligence quotient (I.Q.), private lessons, and other outside influences.

Finally, out of respect to the concerns raised by the classroom teachers involved in this study regarding constant background music possibly interfering with academic

learning, background music was limited to sixty minutes per day during non-academic time. A treatment period that saturates students with repetitive background music to the degree to which they are familiar at home would have been preferred; however, given the constraints of the school day at the research site, this was not possible. As explained earlier, sixty minutes per day was the maximum amount of time permitted by the teachers to apportion to the playing of background music in the classroom.

Importance

Children spend on average twenty-one hours each week listening to music, and as previously noted, often listen to background music or the television while doing their homework (Adriano, 2010). Further, background music is often played in elementary school classrooms with the idea that music will stimulate attention and learning. It would be beneficial for music educators to be able to direct parents and teachers when recommending appropriate background music as a means for supporting a child's musical growth while relaxing, doing his or her homework, or engaging in simple tasks.

It is expected that this study will add to the existing body of literature on the effects of background music on musical development, thus helping to remedy the current deficit of research on the subject. To date, no locatable research has examined the effects of passive listening on the tonal and rhythmic pattern recognition skills of second-grade students. Specific to this investigation, if it can be determined that a designated selection of background music played repeatedly over time during second-grade non-instructional time might positively impact musical development via pattern recognition, the results of such a study would not only inform music teaching practice, but potentially may

generalize to other subjects, tasks and activities that may be useful to students, teachers and parents.

Chapter Two

Review of the Literature

The purpose of this study was to examine the effects of background music on second-grade students' rhythmic and tonal pattern recognition, and the relationship between musical preference and music pattern recognition scores among second-grade children. Given these purposes, the following literature review is organized into two main sections. First, children's musical awareness is examined through the musical elements of rhythm, tempo, tone and harmony. The second relevant area is background music usage in the elementary school, as well as home and non-academic environments. Specific consideration is given to the interaction between characteristics of personality and preference of music with children's response to background music.

Children's Musical Awareness

According to Schellenberg, Bigand, Poulin-Charronnat, Garnier & Stevens (2005), "Young infants appear to begin life as culture-free music listeners" (p. 552). Similar to language acquisition, children also acquire an understanding of the music of their own culture in the same manner. Schellenberg et al. noted several similarities between music and language. Language and music are both universal, and are means for expressing sensitive, meaningful communication. Music and language both have structure, and there exists a hierarchy of rules within each system that regulates its structure. Western music is governed by a musical system based on tonality, and it is unique by virtue of its complex rules of harmony. Research reveals that adults and

children alike are more inclined to recall music that embodies the style of their own culture (Morrison, Demorest, & Stambaugh, 2008).

Morrison et al. (2008) studied the musical knowledge of adults, both musically trained and untrained, from two different countries to examine the impact of enculturation on music learning. After finding that trained and untrained adults exhibited a greater ability to remember music of their native culture, regardless of previous music experience, the researchers turned to elementary students to learn if similar results would emerge. The researchers found that while the effect of a music's complexity was unrelated to the influence of enculturation, both adult and elementary-age subjects were equally capable of remembering simple music examples. Morrison et al. determined that music pattern recognition and discriminatory skills are developed in early childhood, and that increased memory scores for music of one's culture "may represent not simply increased or more sophisticated knowledge of music in general but a richer knowledge of the musical structures and expectations unique to their cultural traditions" (p.125). The researchers concluded that enculturation influences children's knowledge of music structure. This suggests that environment plays a strong role in the development of music aptitude, and that children absorb traditional content of music through means other than formal training, including listening.

It is worth noting that Morrison et al. (2008) conducted their first study on adults from Turkey and the United States, finding that the subjects were more likely to recall music that embodied the styles of their own culture. Subsequently studying college students and fifth-grade students, however, the researchers targeted subjects from the

United States only while playing Turkish and Western music exclusively. Although the researchers concluded that the findings were similar, there was no similar study of comparison between students of the United States and students of Turkey. It is also possible that the ubiquitous influence of Western music worldwide (Nettl, 1985) renders Western music less appropriate in a comparison study, since the subjects are likely to be familiar with Western music.

Rhythm and tempo. Rhythm, the most fundamental musical element, is inherent in biological function. The most obvious physical expressions of rhythm are heart rate and breathing, but rhythmic patterns can also be found even at a cellular level (Chalmers et al., 1999). Howard Gardner (1993; 1999) posited that music is the first of the intelligences to appear in early childhood development. Young children are said to be "open-eared," or in other words, open to a wide range of musical styles and genres (Woody, 2004). In fact, adults often overlook children's awareness of musical sounds. Paquette and Rieg (2008) relate the story of a five-year old boy waiting at a bus stop in the rain, "hopping under the rain spout with his blue and yellow umbrella." When his mother asked what he was doing, the child answered, "I'm listening to the music" (p. 27).

In a 2006 study, Paananen reported using improvisation as a technique for exploring the development of rhythmic learning in children between six and eleven years of age. In a study of thirty-six children, Paananen proposed a sequential model of rhythmic development after working with children from six to eleven years of age. The model is organized so that at the first substage, children have the capacity to focus on either meter or rhythmic grouping. This is followed by the second substage in which

children are capable of focusing on both grouping and meter but are confused by instances where grouping and meter act in opposition. At the third and final substage, children are capable of understanding the conflicting effects of meter and grouping, and could integrate the two. The improvisations of the subjects proved that their ability to process rhythmic structures became more sophisticated over time. The developmental substages were present in the improvisational patterns of the children in each of the three age groups (six-to-seven, eight-to-nine, and ten-to-eleven years of age).

It was noted by Paananen (2006) that very young children are capable of recognizing and creating rhythmic patterns, but their capacity to process rhythmic patterns and pulse simultaneously does not mature until seven years of age. This would appear to support the current research indicating that seven years of age is a pivotal year in a child's musical development (Gardner, 1994; Glover, 2000; Gordon, 1981), and it would seem reasonable to surmise that second-grade students (ages seven and eight) would be a superior choice to that of pre-grade-school children targeted in previous studies for an investigation of the effects of background music on music aptitude (see, for example, Elliott, 1995 and Kwiatkowski, 2001).

In a study of first and second graders, Chalmers et al. (1999) noted that Giles found background music from classic Disney films played after a recess session to have a calming effect on students. Chalmers et al. also noted that for children and adults alike, music played at sixty beats per minute is optimal for encouraging a state of relaxation, possibly because a heart rate of about sixty beats per minute is an ideal resting heart rate in which "a type of entrainment occurs that allows listeners to slow down their heart rate

to match the musical beat" (p. 44). It was hypothesized that indirectly, perhaps this state of relaxation may also positively affect focus and concentration. In an experimental study of college students, the same researchers found that sixty beats per minute successfully decreased noise level and increased students' attention. On consideration of this information, the background music in the current research will be edited for extremes in tempi.

Tone and harmony. Music has been described as a "universal experience" (Foran, 2009, p. 51). With few exceptions, such as persons with amusia, human beings have the capability of distinguishing musical tone, pitch, timbre and harmony. It was noted by Schellenberg et al. (2005) that far more is known about how children develop linguistically than musically. Schellenberg et al. have conducted extensive research on the musical sensitivity of children and adults, musically trained and untrained. The researchers studied subject response to different aspects of music as well as the effects of music instruction on other areas of cognitive development. Schellenberg and Trehub (1996) studied six-year old children with no formal musical training and adults with different degrees of musical training to understand their abilities to distinguish changes in pure tone sequences. The research was built on a prior experiment with adults. Two separate experiments were conducted, one with college students and the other with elementary school children.

The participants of the adult experiment were tested in a soundproof booth where they were presented with two alternating pure tones organized in a five-tone sequence (Schellenberg & Trehub, 1996). The first, third, and fifth tones were identical to each

other and were lower in pitch than the second and fifth tones–which were also identical–thus creating a "rise-fall-rise-fall contour" (p. 1042). The eight sequences were separated by a brief interval of silence, and the patterns were altered to be simple or complex by raising or lowering pitch. The results indicated that changes which increase in complexity are easier for subjects to identify than changes that modulate from complex to simpler examples.

The second experiment involved ninety-six six-year-old children from middle-class families who were presented with the same listening task, but with a third pattern added to focus the children's concentration on the task (Schelllenberg & Trehub, 1996). The outcome followed the same trends as the adults in that the children's ability to discriminate between musical patterns were better when changes were made from simple frequency ratios to more complex.

The same results were noted for all participants with different degrees of musical training, indicating to Schellenberg and Trehub (1996) that the phenomenon may result from constant exposure to Western music. This phenomenon, however, does not rule out the possibility that there may be some detectable organizational features of musical structure that are inherent in many musical styles, or that some characteristics of musical learning–such as simple-to-complex pattern recognition capacity–are a result of inborn cognitive function and would generalize to pattern recognition in other domains. Nevertheless, it is noteworthy that the researchers maintained that some music learning appears to occur "rapidly and effortlessly simply by means of informal exposure to music" (p. 1047).

Dowling, Andrews, and Kwak (1991) studied children from five to ten years of age to determine their ability to recognize familiar melodies presented intact, moving within the same tone (tonal wandering) or outside of the tone (atonal wandering). A previous study by two of the authors (Andrews & Dowling, 1991) found that the children's discriminatory abilities in perceiving the changes increased with age. Dowling et al. used four songs that are familiar to practically all children. In both studies, all subjects could detect changes, but their ability to utilize multiple elements of music as cues grew more sophisticated with age. Rhythm provided the easiest cue, and the more authentic the rhythm, the more likely children were to identify the song despite tonal alterations.

Gromko, Hansen, Tortora, Higgins, and Boccia (2009) observed the effects of temporal sequencing in subjects' ability to recall tones, numbers, and nonsense words. The study built on prior research demonstrating that children were able to transfer skills learned from their music instruction to phonemic awareness (Gromko, 2005). Citing the observations of Schellenberg et al. (2005) regarding the parallels between language facility and musical development, Gromko et al. (2009) posited that the sequencing of syllables and tones is made possible through a common temporal sequencing mechanism in working memories. The purpose of this study was to investigate the validity of that mechanism. The subjects of the study were 389 first, second and third graders enrolled at an urban magnet school.

The recordings used for the memory tasks were created so that they would be consistent for the tonal patterns, numbers, and nonsense words (Gromko et al., 2009).

For the musical memory task, children listened to a female vocalist who sang three-note tonal patterns taken from Gordon's *Primary Measures of Music Audiation* (*PMMA*). In the same manner, children listened to a recording of a female speaker who spoke the numbers and nonsense words, also arranged in patterns of three. A CD was created containing all of the patterns. The *PMMA* was used regularly to test the children's auditory discriminatory skills in their music classes. The memory tasks were conducted privately with each child in a separate, quiet room. The children's responses were recorded using the tonal accuracy function of Garage Band software.

According to Gromko et al. (2009) the results supported the theory that there is a common sequencing mechanism for the recall of tones, numbers and words. Some differences were apparent in the children's recall of the tones, numbers, and nonsense words which the researchers attribute to the unique features of each symbol system. The results also indicated that the children's aural discriminatory skills were connected to the accuracy of their recall for numbers, but not for the tones or nonsense words. Gromko et al. believe this finding is consistent with the relationship they noticed between music instruction and phonemic awareness skills.

Gromko et al. (2009) maintained that their findings provided evidence that children transfer the use of memory skills they develop in one cognitive domain to other areas. They suggest that music teachers can help children develop their memory skills for sound by reinforcing musical patterns through classroom activities such as songs, games, and exercises.

The suggestions made by Gromko et al. (2009) were previously articulated by Fiske (1992) that "...musical understanding occurs in large part without formal training" (p.363), and that pattern perceptual ability can be improved through repetition (Fiske, 1997). Repeated exposure as recommended by Fiske and Gromko et al., however, understandably requires time and opportunity. Neither Elliott (1995) nor Kwiatkowski (2001) were able to establish a relationship between background music and music learning in pre-grade-school children, leading Kwiatkowski to consider that some prior music experiences may be required for children to reap the benefits of musical patterns in background music. The work of Elliott and Kwiatkowski would seem to support the notion that identifying older children of grade-school age with a history of exposure to music might be important factors to consider when studying the effects of background music on music pattern recognition. The gap in the research of Elliott and Kwiatkowski in this regard underscores the need for the current investigation.

In a study involving French, Australian, and Canadian children, Schellenberg et al. (2005) tested the theory that children in Western cultures possess implicit knowledge of harmony. In three separate experiments, subjects listened to a series of chords and then reported their perception of the quality of the final "target" chord. The children were not advised that the musical quality of the target chord was altered in relation to the chord sequence. For half the trials the target chord acted as the tonic of the chord sequence, and for the other half of the trials, the target was a manipulated, less stable chord.

In each of the experiments, subjects were chosen for their differences in their musical training background. The twenty-three French children were first graders and sixth graders, thus representing ages six and eleven (Schellenberg et al., 2005). The six-year-old children had no music training other than the music classes at their elementary school, while the eleven-year-old children had an average of four years of formal music training at a music conservatory, including ear-training study and participation in an orchestra. The Australian group was composed of seven- and eight-year-old children and ten- and eleven-year old children. Approximately half of the children in each age group had formal music training. The forty-four Canadian children were of the same age as their Australian peers. The older children had either two years or more of formal music training, or no music training at all. The younger group had at least one year of music training, or no training at all.

In all three of the experiments, children who had no musical training still evidenced implicit knowledge of the rules of Western harmony. Schellenberg et al. (2005) reported that it was easier for all the children to understand the target chord in the context of the chord series when it served as a tonic chord as opposed to a less stable chord. The children's performance was not improved to any reliable degree by formal music lessons. The researchers ascribed the ability of even the youngest children to comprehend harmony to repeated exposure to music from infancy. Canadian (Bosacki, Francis-Murray, Pollon, & Elliott, 2006) and Australian (Roulston, 2006) children and their parents reported listening to a mixture of musical styles at home. Parents and caregivers sing to infants and young children, and songs often are used regularly in

preschool and elementary school classrooms in promoting literacy. Schellenberg et al. asserted that with regular exposure to music, children quickly acquire knowledge of musical structures. Noting that children typically evidence an understanding of the syntax of their native language by age four, the researchers interpret their findings as evidence that by six years of age, children have some degree of understanding of the rules of syntax in music.

While a study of French, Australian, and Canadian children exclusively may give rise to issues of generalizability to all other cultures, the findings nevertheless make a strong case for children acquiring knowledge of music through repeated exposure; furthermore, the findings strongly suggest that children over six years of age–as proposed in the current study–possess knowledge of musical structures which provides a framework for understanding the music they hear.

Background Music Usage

According to Hallam et al. (2002), studies exploring the cognitive effects of background music conducted during the first half of the twentieth century were simplistic and lacked a theoretical base. In the last twenty years, however, research on background music has become increasingly more sophisticated, as more attention has been given to the uniqueness of the individual listener, the task(s) being performed, the listening environment, and the background music or noise. Even so, gaps still exist in the research. Griffin (2006), for instance, maintained that educators need to examine the research from a range of disciplines to gather insight on how to maximize the benefits of background music in the learning environment. To date, background music has been

studied from the viewpoints of educational, occupational, health, and marketing/consumer psychology. Researchers in each field try to capitalize on music's effects on mood, emotion, and arousal. Griffin supported Jensen's position that through its emotional influence, music has the power to "drive the threesome of attention, meaning and memory" (Jensen, cited in Griffin, 2006, p. 22).

Chalmers et al. (1999) offered several suggestions for using background music in the elementary school setting, both inside and outside the classroom. The authors restated that music containing tempi of sixty beats per minute has demonstrated exceptional effects in creating a soothing and relaxed atmosphere. They also advised that teachers need to experiment with variety of different genres and tempi, regardless of what task the background music is intended to support. The authors noted that children often say they prefer popular to classical music. Chalmers et al. also indicated that for maximum effect, background music should be played on a regular basis. When students become habituated to hearing music, they will learn to recognize its influence on their mood, focus, and concentration. To maximize the benefits of music, the authors recommended that educators experiment with playing music as the students enter the classroom, thereby setting the tone for the day. The authors also recommended playing soft background music when reviewing key concepts or reading aloud to children. This recommendation appears to be inconsistent with later research conducted by Furnham and Strbac (2002) indicating that music negatively influenced introverts' reading comprehension performance. It seems likely that the playing of background music in fact may be unsuitable to children with particular personality characteristics such as

introversion, and the use of background music during certain academic instructional time should be approached with caution.

It bears mention that Chalmers and her colleagues are all special educators. They maintained that music can be especially therapeutic for students with emotional, intellectual and behavioral difficulties. They also warned, however, that educators must to be careful to choose music that will not provoke hyperactivity, for example, in students with attention deficit hyperactivity disorder (ADHD). For students in both special and regular education, the authors noted that music can be combined with relaxation and breathing techniques to manage stress. For younger children, they suggested music from Disney movies, which are familiar to children of that age group. Finally, the authors recommended that educators use background music throughout the school day. Chalmers et al. noted that educators can be very imaginative in taking advantage of the potential benefits of background music in the elementary classroom in general.

Elementary school. Koppelman and Imig (1995) investigated the impact of different styles of music on the writing performance of a second-grade class in Virginia. Second-grade students were chosen for this study due to their lack of experience with the structural elements of writing, and also due to their flexibility in exploring new ideas. The classroom was comprised of nineteen students, mostly African American, and almost all were receiving subsidized lunches. The ten-week study consisted of daily fifteen-minute writing sessions held consistently on the same day and time each week. Each writing session was prepared by a few minutes of physical exercise followed by a cool-down period. No music was played during this time. For the purpose of establishing a

baseline assessment, no music was played during the first writing session. In the weeks that followed, the students wrote while listening to classical, popular, jazz, and country music respectively. Each type of music was played for two sessions. For five minutes at the end of each writing session, the students were given the opportunity to illustrate what they wrote in a "quick draw" session. Those children who preferred not to draw were assigned five minutes of silent reading.

At the end of the ten sessions, the writing samples were examined for tone, consistency, and number of words. *Tone* was identified as being positive, negative, or ambivalent. *Consistency* was identified as being on-topic or related to the same general topic (with at least three sentences relating to the same theme). Koppelman and Imig (1995) also noted that the students had a substantial degree of writing experience prior to the study: students regularly participated in daily writing sessions before the study, and the students also kept journals in which they were required to write at the end of every day. Using tone, consistency, and a word count tool to assess their writing, the results indicated that both classical and jazz music had a significant positive impact on the children's writing. The researchers noted no effect of country music on their writing. The researchers observed, however, that playing top forty songs during the writing sessions had a strong negative impact on writing. Children were observed singing and dancing when they heard the familiar music, and some students fought over who knew the songs better. Koppelman and Imig described the mood as "festive" (p. 19).

It was observed that on hearing all styles of music, the children needed some time to calm down. They quickly acclimated to the classical, jazz, and country music,

however, and focused on the writing activity (Koppelman and Imig, 1995). In contrast, the top forty songs provoked a response that not only took extra time to dissipate, but also interfered with the task. It was especially noteworthy that during the last writing session when it was evident that no music was going to be played, the children asked, "Where's the music?" The authors inferred that the students enjoyed working to music, and with classical and jazz music playing, they worked more productively. Koppelman and Imig suggested that teachers integrate background music into all curriculum subjects to create a calmer and motivating learning environment. The authors reported that apparently none of the students were familiar with any of the jazz, classical, or country pieces, and it is suggested that perhaps the second-grade classroom is an ideal venue for introducing children to a variety of music while they are still receptive to hearing different styles of musical expression (Szabo, 2005).

In an action research project focused on first-grade students, Seda (2009) explored the effects of music on writing proficiency. Seventeen students from academically and ethnically diverse backgrounds were randomly chosen by the principal for the six-week project. During the project, students worked with background music for twenty-minute sessions every day for three weeks (weeks one, three and five), and worked in silence for twenty-minute sessions every day for three weeks (two, four, and six). The musical piece played was a selection from a classical guitar CD by the Boccherini Guitar Quartet, and the music played at a tempo consistent with recommendations made by Chalmers et al. (1999). A rubric designed by the school district was the tool used for assessing the impact of background music on the writing samples; quantitative analysis performed

showed no significant effect of classical music on the student's writing performance. Instead, Seda surmised that the results evidenced the ordinary effects of practice as the children's writing improved over time. The researcher considered that the week's vacation from school occurring between weeks four and five might have had a disruptive effect; however, the week away from school could not explain the negligible effects of music on the children's performance. When the samples were evaluated by gender, there was some indication that listening to music enhanced the quality of the boys' writing while negatively impacting the quality of the girls' writing. Neither effect carried any statistical significance.

Seda (2009) did observe one remarkable result of the background music. A student who was diagnosed with ADHD showed consistent improvement in performance when music was played. Although the difference was not statistically significant, it may be of interest to special educators. With classical music playing in the background, this student exhibited improved behavior and concentration, was more relaxed, and was more focused on the task. This behavior is consistent with the research on the effects of background music on attention, behavior, and emotion regulation (Chalmers et al., 1999; Foran, 2009; Hallam & Price, 1998).

Despite the absence of significant improvement in performance, Seda (2009) noted that the class in general was more focused, on task, and behaved better during the writing sessions when the background music was played. In fact, Seda reports that the classroom was actually quieter with music. Music may not have had a significant positive impact on writing; however, it still created a more pleasant learning

environment. Furthermore, the students really enjoyed listening to music. When the study was concluded, Seda continued to offer the class the option of working to background music. Whenever the choice was presented, almost all of the students voted in favor of listening to background music.

McGovern (2000) conducted an action research project on the effects of music in a third-grade classroom. The suburban elementary school in Illinois was largely African American, with over sixty percent of students labeled as low-income, and the school population being considered 'at-risk' based on failing standardized test scores in reading and writing. Drawing from Gardner's (1993; 1999) Multiple Intelligences theory, the researcher formulated the study by building on empirical literature reporting the benefits of background music on the classroom learning environment.

McGovern (2000) mentioned that the classical music she chose for the study deviated from the children's professed favorite styles of music, specifically rap and hip-hop. The project, however, included a range of styles. The study began with a survey designed to reveal the attitudes of the students toward music. A survey was also distributed to the parents of the eighteen students at the beginning of the project to ascertain their feelings about having music in the classroom. The project was divided into three phases, covering three parts of the fall academic semester: *Climate/Management, Motivation and Learning/Skills*. After establishing a baseline, the focus starting with week three was on *Classroom Climate/Management* for the purpose of improving the learning environment. During week four, baroque music was played at a

low volume to create a calm atmosphere. For the following two weeks, McGovern experimented with a variety of musical pieces to facilitate transitions.

During the first phase of the project, McGovern (2000) used music as a classroom management tool. For example, the students were taught a specific rhythmic pattern that the teacher clapped to signal that she needed their attention. The students would repeat the rhythm, which served to focus their attention in order to transition to the next activity. In week six, the class was introduced to instrumental music that played during small group activities. The students were advised that they should always be able to hear the background music, meaning their speaking volume had to be softer than the music. Raising the volume of the background music and then dropping it down to zero was also used as a nonverbal technique for gaining the class's attention.

Motivation was the focus of weeks seven and eight. Inspiring songs from the "Chicken Soup for the Soul" CD set were used to improve self-esteem and create an upbeat class dynamic to jump-start the day. The focus of weeks nine and ten were on *Learning/Skills.* For these lessons, McGovern (2000) played music to make learning important facts and concepts more fun for the students. She theorized that the experience would be particularly advantageous for children with a strong musical aptitude. The activities included the use of rhythm spelling to support students' efforts in spelling, and the use of educational lyrics in songs and movements to assist in learning in targeted areas of literacy and mathematics. For the final four weeks of the project, McGovern combined the music strategies utilized throughout the project. The study included a survey inquiring as to the students' opinions of each of the tactics employed.

McGovern (2000) was not surprised to find rhythm spelling to be particularly successful, since it turned an otherwise tedious task into an enjoyable activity, and this was confirmed by the students. The clapping rhythm proved to be less popular with the students, although most students expressed the desire to continue the activity in the future. McGovern also noted that students expressed enthusiasm for using music while cleaning out their desks. The strategy that proved to be the least successful was listening to background music in the morning containing motivational text. Many students found it distracting, and while some reported it to be calming, others noted that the low volume and slow beat were annoying. The survey evidenced mixed results and raised doubt as to whether or not the morning music should continue. McGovern concluded that the choice of morning music did not have the desired effect.

Paradoxically, the students agreed unanimously that they would like the motivational music played in the afternoon to continue. McGovern (2000) observed that the afternoon music was an excellent strategy for refocusing and energizing students during the part of the day when they became listless and inattentive. In general, the children enjoyed hearing music played in the classroom. According to McGovern, student feedback provides an effective touchstone for determining the success of certain strategies, and modifying or eliminating the ones that prove to be unsuccessful. McGovern believes that the children's enthusiasm for music was revealed by an end-of-year questionnaire in which students were asked to identify all the ways music was used in the classroom. On reviewing their lists, McGovern noted that some of the activities listed were not actually accompanied by music. When she mentioned this to the class,

they responded that they thought they had used music during those activities "because they were fun!" According to McGovern, "This comment said it all. The children thought everything we did that they enjoyed was because music was involved" (p. 27). McGovern interpreted this response to indicate that the music project was a success.

But will similar results hold in classroom environments with older elementary students? Hallam et al. (2002) and Davidson and Powell (1986) studied the effects of background music on the task performance of twenty-six fifth-grade children in England and the United States. The class was highly diverse, both academically and socio-demographically. In their experimental design, the authors observed students' on-task performance for over forty science lessons covering a period of four months. The music chosen for the study was "easy listening" music, which the authors defined as "music which has a melodic line over non-dissonant chordal structures and is non-percussive in beat," and has "rich use of strings and winds" (p. 30). Each fifth grader's on-task behavior was recorded at three-minute intervals during the sessions each day, four days per week for four months. After each observation, the researchers evaluated the amount of on-task time spent by gender, and for the class as a whole. The musical environment alternated between music and no music.

The results for the boys were statistically significant, revealing that easy listening music effectively increased the time spent on task by the fifth graders, particularly for boys. Davidson and Powell (1986) noticed only a slight increase of on-task time for girls, with girls already spending nearly the entire lesson engaged in on-task behavior. The authors determined that playing easy listening background music is both a successful

and cost-efficient approach to increasing the amount of time that students are focused on on-task learning.

Similar to Chalmers et al. (1999), Hallam et al. (2002) were also motivated by Giles's research that reported on the soothing effects of music from Disney films. Two studies were conducted using both Disney music and other music thought to be appealing to children. The first study involved thirty-one sixth graders from a school in London. The students were randomly assigned to one of two groups for math instruction; one worked under the condition of background music, while the other worked under the condition of no music. Math time was traditionally a quiet time for these students, and while the students had experienced background music before in other more creative subjects, this project marked the first time they experienced music accompanying their math lessons. The fifteen-minute math sessions were held as the first lesson of the day over four consecutive days. Except for the condition of background music, both groups received identical treatment. Following each lesson, the researchers noted the number of problems each student tried to solve, the number of problems each student finished successfully, and their degree of accuracy.

The results indicated that the students in the music group completed considerably more math problems than did the students in the non-music group (forty versus twenty-seven). The students in the music group also had a higher rate of accuracy and completed a greater number of problems correctly than did the non-music group, although the differences in the numbers were not statistically significant. Of particular interest to Hallam et al. (2002) was the fact that there appeared to be a much greater degree of

individual variation in accuracy in those students who listened to music. As a result, the researchers determined that music perceived as pleasant by the student has a soothing effect which, in turn, can sharpen focus and improve productivity among students who are generally conscientious and productive. It also raised the question as to whether music "perceived as arousing, aggressive, and unpleasant" would have an unstable or distracting effect on task performance (p. 116).

The second study conducted by Hallam et al. (2002) involved thirty students that attended three schools in England. Children were randomly assigned to one of three groups: a group listening to soothing music, a group listening to aggressive music, and a control group that worked in silence. The music selected for the two groups were Albinoni's "Adagio in G minor" and "The Father, the Son and the Holy Ghost" from John Coltrane's CD *Meditations*, respectively. For this study, the students were given a memory task and an altruism task. The memory task, described as moderately difficult, required that students remember a word from each sentence in a series of ten sentences. Students were given a booklet of ten sentence cards, and ten recall cards that presented the same sentences but with a blank space where the target word was missing. The students were also given a booklet containing ten stories and a choice of responses to questions about the stories.

In the altruism task, the students were offered a series of scenarios and directed to choose a response to each one. The scenarios were constructed to reflect a balance of male and female protagonists (Hallam et al., 2002). The findings evidenced that background music that can be clearly defined as either calming or unpleasant evokes very

distinctive effects on task performance and incidents of altruistic behavior. Based on both studies, music described as pleasant and soothing had a positive effect on the rate of completion of math problems, word recall, and intentions to engage in positive social behavior among older children ten to twelve years of age. Music described as aggressive and unpleasant, however, negatively impacted the memory task and reduced incidents of positive social intentions.

According to Hallam et al. (2002), the findings seemed to indicate that background music affected task performance through its effects of mood and arousal. The researchers posited that the effects of music on performance must be considered as function of its interacting elements, including the listening environment, the type of music being played, the subjects' recent life events, metacognition, and task requirements. They concurred with Chalmers et al. (1999) in that background music could prove to be a distraction for children with attention issues such as ADHD. This position was contradicted by Črnčec et al. (2006) and Seda (2009), all of whom found that the use of background music improved both the behavior and the performance of children with special needs. Hallam et al. conceded the possibility that background music might prove to be less of a distraction for these children than other types of environmental distractions. The thrust of their position was that background music must be considered carefully in order to produce the preferred results, especially when working with children who have behavioral or attention issues.

Of particular interest in this study is the effect of arousing or soothing music on altruistic intentions. This finding has significant implications for creating a positive

classroom environment conducive to optimal learning. Hallam et al. (2002) posed the interesting question as to whether or not the effects of background music might dissipate if the teachers played music with consistency. The majority of educational researchers who have witnessed positive results on investigating the effects of background music on behavior and learning recommended that educators continue to play music with regularity during the same activities in which background music was first initiated and in which the playing of background music appeared to elicit useful results. Further, the empirical data show that once children have become acclimated to hearing background music played in the classroom, they express disappointment when they have to work in silence. Success appears to rest with the selection of the most appropriate type of music for the time of day, the activity, or the children's moods and energy levels. The researchers offered suggestions on adapting the music to fit the occasion; for example, playing soothing music when the students return from lunch or physical activities, or when students are excited about an upcoming event, and playing upbeat music when students' energy levels are low.

Hallam et al. (2002) also suggested the integration of music into children's school day outside the music classroom to encourage positive social behavior in other environments where children might be disruptive. In response to the criticism that this approach diminishes the inherent value of music, the authors indicated that, "Much of our knowledge of musical repertoire comes from listening in informal settings while we undertake other activities" (p. 120). Further, as Griffin (2004) pointed out, educators can take note of other areas of research, for instance consumer research, where retailers

repeatedly take advantage of the powers of music in advertising. Finally, Hallam et al. (2002) stressed that music played in the school to promote learning and positive social behavior also has the capacity to "enhance musical knowledge and thinking" (p. 120). According to Hallam et al. (2002), the effects of background music on children's mood and arousal may have implications beyond the classroom walls. The researchers mentioned that teenagers and adults are aware of the unfavorable effects of certain types of music on their behavior and task performance, but they posited that elementary school children are generally unable to distinguish such effects. This may not be accurate. Some of the third-grader students in McGovern's (2000) class, for example, were able to articulate negative ways that the music impacted them in the classroom. However, perhaps distinguishing more subtle effects would be beyond the developmental abilities of elementary school children. Accordingly, Hallam et al. maintained that parents should monitor the music to which their young children listen, and inform them about the possible negative effects of music. The researchers also projected that as children mature, they will be able to choose appropriate music for the task that will enhance rather than disrupt the process. This point is particularly applicable given the fact that many young people do their homework with music in the background. The researchers suggested that parents need to take an active role in becoming educated on the subject so that they in turn might teach and encourage their children to make productive for themselves.

Non-academic environments. Chalmers et al. (1999) were motivated to investigate the effects of background music played in an elementary school lunchroom

after an event at the school of the son of one of the authors. She met her son at the school lunchroom to give him a message, and arrived to find him resting his head on the table with his hands over his ears. She thought he might be ill, but when she asked him what was wrong, he answered, "I'm just trying to block out the noise, Mom!" (p. 44). The researchers later learned that the noise level in the cafeteria was equivalent to that of a passing subway train. Four supervisors were responsible for monitoring the lunchroom, and the behavior included a range of disruptive behaviors, including hitting, screaming, and food fights.

Chalmers et al. (1999) built the study on prior research demonstrating the soothing effects of music on children's behavior, including their own research on the positive effects of background music in various educational settings. In order to determine a baseline measure of the noise level in the lunchroom, the researchers used a decibel meter for over twenty lunch sessions, and recorded the noise at intervals of five minutes each for five lunch waves. Data were also collected to determine the number of behavioral incidents. The background music was rotated so that five days of background music were followed by two or three days with no music at all.

Over the course of five lunch periods, Chalmers et al. (1999) played a tape of classical piano music at sixty beats per minute and observed a significant decline in the both the noise levels in the cafeteria and the number of disruptive behaviors requiring adult intervention. After three days of no music, the researchers played a recording of popular music with slow-to-moderate tempi for five days. The experiment ended with another two days of the no-music condition. On reviewing the data, the researchers

observed a notable pattern. The noise levels were fairly consistent when no music was played. When the tape of classical piano was played, the noise level decreased by an average of six decibels or seven percent. When the popular music was played, the noise level decreased by ten decibels or twelve percent. In reducing behavioral infractions, both musical styles were equally successful. In the no-music condition, there was an average of twenty behavioral interventions, or one per minute; however, this number dropped to an average of seven per lunch session, or roughly one every three minutes with either classical or popular music.

The decreases in noise and behavioral problems were statistically insignificant; however, Chalmers et al. (1999) remarked that the decreases in noise made the lunch period more pleasant for both the children and the adults. At their worst, the noise levels were in the range of factory noise or light traffic, but when soft background music was playing, the noise level decreased into the range of conversational speech. Music had the most significant impact on behavioral incidents, reducing the need for adult intervention by sixty-five percent. The researchers hypothesized that the decrease in adult intervention might be attributed to both the improvement of the students' behavior as well as the more calm state of the supervisors. The incidents reported were generally minor and routine for elementary school children. Out of 116 children surveyed afterward, 103 claimed they enjoyed having music played at lunch, and nearly all students reported that they preferred the popular music to classical piano music. The self-reported preference for popular music over classical music is consistent with most of the current research (Bosacki et al., 2006; Roulston, 2006), although the extent to which

peer pressure may have influenced students' responses to popular music is unclear. The research indicates that children as young as the third grade are susceptible to peer influence (Berndt, 1979); therefore, it is conceivable that the trend for children to profess a preference for the popular music to which their friends are listening over classical music could be an indicator of a desire for peer conformity rather than an accurate representation of musical preference.

Home study habits. Adriano (2010) agreed with the premise presented by Anderson and Fuller (2010) that music is a dominant force in the lives of adolescents; however, Adriano's research departed from the usual experimental studies that currently drive the research on the influence of background music on task performance. Instead, Adriano employed a mixed methods design on a sample of 688 secondary school students, gathering data through surveys and focus groups. The intent was to highlight the study habits of students with regard to listening to music, musical preferences and habits, and their general efficiency when doing homework. The researcher also gathered quantitative data for analysis, including the students' grades in English and mathematics, grade level and gender.

The results suggested that many students may be aware of the effects of music on reading. While some of the students reported that they listened to music because they felt it improved their concentration on academic tasks, a number of students reported that they did not listen to music when reading because they felt it to be a distraction (Adriano, 2010). The detrimental effect of music on reading was confirmed by the lower performance in English and math of those students who listened to music while they

worked on reading and writing assignments at home. It was also noted that listening to music while working on math homework had no impact on grades in mathematics or English. The research continues to indicate that helping children to choose music that is compatible with the task at hand is necessary for producing positive results.

Children's music preferences. With regard to the students' musical preferences, Adriano (2010) determined that students who preferred to listen to rap, heavy metal, and techno music tended to be lower performers in English and mathematics. Adriano also commented that while very few students admit they prefer classical music, most studies on the effects of background music utilize classical music. Adriano's observation illustrates the need for more investigations into the effects of children's music preferences on their response to background music. The conclusion of Thompson et al. (2001), for example, indicating that the Mozart effect was a manifestation of the well-documented effects of music on mood and arousal, suggests a plausible reason to consider children's preferences in studies on background music. If, however, Adriano's conclusions were correct in that the preferred music of children such as rap, heavy metal, and techno music negatively impact academic performance, then the preferences of children cannot necessarily be taken into consideration when choosing appropriate background music for the classroom.

Anderson and Fuller (2010) conducted a quantitative study on the effects of lyrical music on adolescents' reading comprehension, citing the lack of consistency in the extant literature on past results as the motivation for the study. Past findings produced a range of results from viewing music as a distraction to task performance to viewing it as

beneficial. The researchers conducted an experiment with two groups: one received the condition of top hit singles, and the other received the condition of no music. Students were also asked to complete a survey to determine whether or not they preferred to listen to music while they studied. The results demonstrated a significant deterioration in performance under the condition of music.

When asked about their music preferences, most students in McGovern's study (2000) reported that their favorite style of music was rap. Other preferred types of music included gospel, rhythm and blues, and rock, and McGovern noted that many children identified more than one favorite style of music. Even though seven out of seventeen students stated they did not like listening to classical music, the students all agreed on one point: they all enjoyed listening to all the music. Noteworthy was the fact that they disagreed on whether they thought music could support their learning. Only eight students believed music might be helpful in learning. McGovern found this point particularly interesting given that the students unanimously reported that they enjoyed listening to the music. For most of the children, the element of music as a tool in the classroom was an unknown technique, so it was particularly interesting that they could identify specific ways that it supported their learning. Despite the reported aversion to classical music, McGovern (2000) maintained that she was able to use music in the classroom to facilitate transitions, improve the classroom atmosphere, relax students, and connect with students in the learning process.

While children often profess to favor other styles of music to classical, there is evidence to suggest that they often perform better with classical music than their

preferred choices. Koppelman and Imig (1995) noted that classical and jazz music had a significant and positive impact on the children's writing; Seda (2009) observed significant improvement in the performance of a student diagnosed with ADHD with the introduction of classical guitar into the classroom environment; and Chalmers et al. (1999) noticed a decrease in noise and disruptive behaviors in her son's cafeteria with both classical and popular background music. Furnham and Strbac (2002) studied student response to Garage Style music, and while students professed to like the music, all subjects evidenced a negative impact on task performance. Children report a preference for music with lyrics; however, the research indicates that listening to music with lyrics generally has a negative effect on reading comprehension task performance (Furnham & Allass, 1999; Furnham and Strbac (2002).

People with music training often forget how untrained individuals perceive music (Woody, 2004). Likewise, adults often lack insight as to the musical preferences of children. With the expanse of modern musical technology at their disposal, children are constantly exposed to music both inside and outside the home (Bosacki, Francis-Murray, Pollon, & Elliott, 2006; Roulston, 2006). Even very young children express personal preferences with respect to music, and although many children are exposed to a variety of genres, children from lower-income backgrounds are less likely than their peers of a higher socio-economic status to be familiar with classical music for example. Considering the strong relationship between preference opinions and familiarity (Demorest & Schultz, 2004), perhaps this is another reason children profess a dislike for classical music.

If Anderson and Fuller (2010) were correct in their assumptions that productivity is conversely associated with preference of music, then the concern voiced by Adriano (2010)–that most studies on the effects of background music employ classical music despite students' aversion to it–is unfounded. With respect to the current investigation, it is expected that students will respond favorably to the presence of classical background music.

Personality and background sound. A remarkable characteristic of many studies of background music and task performance is that there is a greater degree of individual differences in performance when the music is played. In studies involving children, it is often hypothesized that the disparity is due to reported study skills, gender, exposure at home to music, or other factors outside the scope of the study. There is little mention, however, of the possibility that personality characteristics play a part in individual reactions to background music. Furnham and Allass (1999) faulted the researchers of past studies for disregarding inherent individual differences in arousal levels, citing studies that reported on the effects of music on arousal. They called attention to the idea that individual internal arousal levels are key to Eysenck's theory of personality. According to Esyenck's theory, introverts and extroverts differ in the amount of environmental stimuli they need to create a level of ideal arousal. Neurologically, introverts have a lower threshold for arousal; as such, they feel a greater degree of arousal in response to a lower level of stimulus. Once their arousal levels exceed an optimal level, introverts experience an adverse effect.

In a 1997 study, Furnham and Bradley noted that the task performance of introverts in the areas of memory and reading was negatively impacted when working to popular background music on the radio with speech by a male announcer in between songs. Furnham and Allass (1999) later built on this research by investigating the role of musical complexity on cognitive task performance of introverts and extroverts. The study comprised 163 college students who, after a personality test, were identified as either introverts or extroverts. A subgroup of forty-eight students earned extreme scores in either extroversion or introversion. A panel of musical experts chose the music by rating fourteen popular songs on the elements of tempo, rhythmic complexity, melodic complexity, repetition, vocal meaningfulness, instrumental layering, and overall complexity. Familiar songs were eliminated, and of the remaining songs, those with the lowest scores labeled *simple* and those with the highest scores were labeled *complex.* Each category contained three pieces of music.

Prior to the experiment, the participants completed a personal background questionnaire. The reading comprehension test used was drawn from the book of Graduate Admission Tests (GMAT), and the memory test used was taken from the British Ability Scales test battery (Furnham & Allass, 1999). A simple math worksheet was administered during the six-minute break separating the test of immediate recall from the test of delayed recall to provide a brief distraction, but the results were not included in the final analysis. Another test of clear thinking and observation was included in the final analysis. This test was drawn from the *Advanced Progressive Matrices: Set I* (APM). Working under one of three conditions – complex music, simple music, or silence – the

participants completed each of the three tests, each one under a different condition. The students listened to the music through headphones, and all selections were played at a consistent, moderate volume.

None of the background music, simple or complex, had any significant impact on task performance. Furnham and Allass (1999) noted, however, that there were dissimilarities in the responses of introverts versus extroverts to the presence of background music. On both the memory and observation tasks, the extroverts' performance improved when working with background music as opposed to working in silence. As the music increased in complexity, and as their arousal increased, the effect became more pronounced. Conversely, the introverts experienced the opposite effect. As the music became more complex, their performance diminished. The participants' scores on the reading comprehension test demonstrated the same results but to a smaller degree. While the research is compelling, the question remains as to whether or not the results of this research would generalize to younger children.

Furnham and Strbac (2002) pursued a similar channel of research in a later study, but incorporated background noise in addition to background music. The counterproductive influence of environmental noise on task performance in the workplace has been well documented; however, the researchers observe that studies are scarce documenting individual differences in response to background noise. Furnham and Strbac noted that while most of the studies on personality have been conducted on college students, they chose to focus their research instead on high school students. There were seventy-six participants in all, with forty-three boys and thirty-three girls.

The participants averaged about seventeen years of age, with an equal number of introverts and extroverts.

Furnham & Strbac (2002) used noise taken from a BBC SFX CD entitled "Essential Sounds of the City" containing a combination of conventional office noises, including typing, faxes, telephones, and people mumbling. The researchers commented that the mixture of background noise on the CD was innately original and unpredictable; however, with regard to the background music, they made a choice to find music that was completely original by choosing a CD that had not been released yet. While the students were familiar with the style – Garage style music – they were not familiar with the specific songs. All of the pieces were lively in tempo, contained vocals, were non-repetitive, and contained a considerable amount of musical layering. The recording used for the study was mixed by a professional disc jockey and played on a cassette player located at the front of the room.

The reading comprehension test, drawn from SHL Practices Tests, contained seven passages with four multiple-choice questions each. The students had seven minutes in which to finish the task (Furnham & Strbac, 2002). For the memory test, the students were given five minutes to read a segment on proper and improper stretching. The material was taken from a book on martial arts, and after a five-minute delay, participants were asked to recall the segment. The third task involved the addition or subtraction of twelve sets of fifteen single-digit math problems. The participants' work was evaluated for accuracy. The test groups contained between nineteen and twenty-one participants, and each student worked on a single task under each of the three conditions:

noise, music, or silence. At the conclusion of the experiment, the students were given a survey and asked to indicate how distracting they perceived the noise and music to be, how motivated they felt, and how often they worked with music or noise in the background in general.

As predicted by Furnham and Strbac (2002), all background sound, noise and music negatively influenced the introverts' reading comprehension performance. Regarding the memory and the math tests, the divergence between the introverts and the extroverts in the presence of background sound was much less obvious, but still evidenced a negative impact. There was also some difference in the impact of music and noise on task performance, but that fell short of statistical significance. The researchers conjectured that the complexities of music and noise might be comparable; additionally, the music was chosen specifically because it was unfamiliar to the participants.

The question arose as to why the background sound, noise and music exercised the most powerful adverse effect on the introverts' reading comprehension performance as compared to the other tests (Furnham & Strbac, 2002). These results appear to be comparable to the negative effects of popular music containing lyrics on reading performance reported in other research (Anderson & Fuller, 2010; Adriano, 2010). It is feasible that the subjects in Adriano's study who reported that they perform reading assignments at home in silence because they found music to be distracting could be introverts. Introvert/extrovert personality characteristics, however, would not explain the detrimental effect of popular music on the junior high school students in Anderson and Fuller's experiment, particularly considering the prevalence of extroverts in the general

population, and considering the small number of students who demonstrated equivalent or superior reading performance when background music was played.

Similarly, the premise that music containing lyrics in general has a negative effect on reading comprehension when lyrics or speech interferes is inconsistent with the positive or neutral effect of popular music containing lyrics on the extroverts in Furnham's research (Furnham & Allass, 1999; Furnham & Strbac (2002). That premise would also fail to account for the similar effects of Garage style music and office noise. Furnham and Strbac (2002) mentioned that other research has detailed the negative effects of background noise on the performance of complex tasks.

Again with regards to the research of Furnham and Allass (1999) and Furnham and Strbac (2002), the issue of generalizability to younger children needs to be considered. It can be assumed that older students have a higher level of cognitive development than that of younger children, and therefore their reactions to background sound may be different. Additionally, the responses of high school and college students may represent years of exposure to Western music. Studying the element of personality characteristics in this phenomenon on subjects of all ages contributes to the knowledge base on background music and task performance, while at the same time forging paths for future exploration.

Chamorro-Premuzic, Swami, Furnham, and Maakip (2009) expanded this channel of research by replicating a study of background music involving the Big Five personality traits. The original study, carried out by Chamorro-Premuzic and Furnham, took place in the United Kingdom, while the replication study was conducted in Malaysia. The sample

was comprised of 227 Malaysian college students. Chamorro-Premuzic et al. expressed skepticism that cross-cultural differences would surface in the music listening habits of young adults, despite differences in musical preferences. The 'Big Five' personality traits included Openness (curious versus cautious), Extraversion (outgoing versus reserved), Conscientiousness (efficient versus careless) Agreeableness (friendly versus cold) and Neuroticism (nervous versus secure).

The study revealed some interesting patterns in the preferred use of music with regard to personality traits. Extroverts used music as background or for distraction. Students who scored higher in neuroticism were apt to use music to regulate their emotions. Students who scored high marks on openness to experience revealed using music for intellectual purposes. Chamorro-Premuzic et al. (2009) noted that these preferences are similar to the patterns found in the U.K. study. The use of music for regulating emotions by those students who scored high in neuroticism was consistent with the research identifying the calming effects of music on feelings such as depression or anxiety. In similar fashion, the findings for extroverts were analogous to the earlier studies of the characteristics of introverts and extroverts (Furnham & Allass, 1999; Furnham & Strbac, 2002). Regarding openness to experience, Chamorro-Premuzic et al. (2009) cited research documenting a link between openness and intelligence; they also cited research reporting that people who are both intelligent and open to new experience are inclined to prefer music described as "reflective and complex" (p. 25). The authors suggested that future research would reveal new insights into the dynamics of personality characteristics and how they impact individual response to background music and sound.

With respect to the current research, if Esyenck's theory is accurate in that introverts and extroverts differ in the amount of environmental stimuli they need to create the ideal level of arousal, then it seems reasonable to break up any treatment period into segments, which is the strategy proposed in the current research. While the extroverts in the study will not be negatively impacted by the segmenting of background music, the introverts most certainly would be negatively impacted by an unyielding hour-long treatment period. Furthermore, given that it seems clear that more research is required to shed light on the dynamics of personality characteristics interacting with memory and comprehension with the introduction of background music into the environment (Chamorro-Premuzic et al., 2009), the current study will circumvent any ethical concerns of negatively impacting classroom instruction by limiting the playing of background music to non-academic periods.

Conclusion

The research investigated in this literature review offers a framework for the current study. The void in the literature continues to emphasize the need for a study on the effects of passive music listening on music aptitude. Although the works of Elliott (1995) and Kwiatkowski (2001) examined some aspects of the scope of the current study, including the effects of background music on pre-grade-school children, no known research has investigated the effects of background music on the tonal and rhythmic pattern recognition skills of second-grade students. For all the reasons cited earlier indicating that the second grade is a pivotal year in the musical development of a child (Gardner, 1994; Glover, 2000; Gordon, 1981), a study targeting second-grade children is

the logical next step in the progression of studies on the effects of background music on the music aptitude of children. The current research will also improve on the issues presented in the Elliott and Kwiatkowski studies with regards to the background music played by using short excerpts of pieces containing a wide variety of musical elements, including genres, dynamics, tempi, instrumentation, and rhythmic and melodic variations.

Thus far, three main branches of research have developed that investigate the effects of music on other areas of learning: focused music listening, music instruction, and background music (Črnčec et al., 2006). Črnčec et al. suggested that music listening and music study can yield some non-musical benefits. The studies on the subject of focused music listening, music instruction, and background music on mood and behavior have drawn a high level of interest to date perhaps because they served to validate music's presence in today's school curriculum. Suzuki (1998) and Gordon (1979; 1982; 2011) both emphasized the value of focused listening and repetition to develop pattern-recognition skills. While the study of the effects of passive listening on music aptitude seems like the next logical step in this line of research, with so much attention on the potential uses of background music in the classroom to affect mood, behavior, focus and cognitive gains, the area of the effects of background music on music aptitude remains largely unexplored.

To summarize, many studies link involvement in music with social, emotional and cognitive growth (NAfME, 2007); however, it seems likely that this connection is a direct result of formal music training rather than informal listening. While it is plausible that many children will exhibit a decrease in disruptive behaviors, a calmer demeanor,

heightened focus and keener attention in response to the consistent presence of background music, whether or not their music aptitudes will improve with background music remains to be seen. While the existing body of research indicates that children acquire knowledge of the elements of music indirectly through informal exposure (Schellenberg et al., 2005), given the scarcity of data available on the subject of the effect of background music on music aptitude, the current investigation will attempt to shed light upon this conundrum.

Chapter Three

Methodology and Design

The following is an overview of the design of the current study, beginning with a detailed discussion of the treatment employed in this experiment. Included in this chapter is an explanation of the experimental design of the current study, along with in-depth justifications regarding the nature of the treatment, the age of the subjects, and the choice of background music. Next, the participants are described, and a comprehensive explanation of the school enrollment is presented. This is followed by a brief discussion on the efforts taken in ensuring the ethical treatment of participants. The section on instrumentation offers a thorough description of the standardized music aptitude test, the audio equipment, and the Music Preference Questionnaire (MPQ). Finally, an explanation of the test administration, test scoring and the handling of statistical data is presented, along with information regarding the processing and interpreting of data.

Treatment

To investigate the effect of repetitive background music on second-grade children's rhythmic and tonal pattern recognition, the current study followed a mixed-methods, experimental study design with a causal-comparative dimension. A cluster sample of participants (N=60) included second-grade students from four intact classes in one elementary school. Two of the four intact classes each were randomly designated as the control groups. The treatment chosen for this investigation was the repetition of background music for sixty minutes every school day over the course of fourteen weeks.

Music aptitude pretests were administered to all sixty participants to assess their tonal and rhythmic pattern recognition skills. Then, background music was played each school morning for the treatment group at the beginning of the school day for thirty minutes during the arrival session while students engaged in routine, non-academic activities (e.g., signed in, emptied book bags, submitted homework, ordered lunches, updated the calendar, made changes to the weather station), and at the end of every afternoon for thirty minutes while students prepared for dismissal (e.g., recorded homework activities in the homework log, packed book bags, gathered coats, put away personal classroom materials, cleaned the classroom, placed chairs on top of the desks, listened for bus information). After the selection of background music was administered to the treatment group for a period of sixty minutes per day for a period of fourteen weeks, a music aptitude posttest was administered to all sixty students to determine if any changes in music aptitude were present in the treatment group.

As indicated earlier, two previous studies that employed experimental designs on the effects of background music on music aptitude in four- and five-year-old children (Elliott, 1995; Kwiatkowski, 2001) failed to establish a main effect. Both researchers conjectured as to many possible reasons the results of their studies fell short of statistical significance; these reasons included the age of the subjects relative to their limited music instruction and music experience. In response to this point, it would seem plausible that second-grade students (ages seven and eight) would be a better choice for the next step in this area of research based on the merits of the current research indicating that the second grade is a pivotal year in a child's musical development. As previously mentioned,

Glover (2000) maintained that by seven years of age, children are starting to think about musical structure. As previously cited, Gardner (1994) also proposed that at around the age of seven, children have "a working familiarity with and understanding of the general mechanisms of this [music] symbol system" (p.197). Finally, it has been noted that Gordon (1981) suggested that the music aptitude of an elementary school child is still malleable and influenced by his or her environment until about the age of nine.

Kwiatkowski (2001) speculated that it is possible that children such as those in the present study might require some elementary musical foreknowledge, including "...instruction to guide their attention to the attributes of the music, to increase aptitude and discriminatory abilities..." (pp. 79-80). Elliott (1995) expressed concern about the age of the subjects in her study and their relatively limited test-taking experiences when she observed that many of the children were distracted while taking the *PMMA* test. She also suggested that the length of the test was possibly too difficult for many kindergarten children to endure. In a study on the effects of music instruction on the developmental aptitude of kindergarten children, Flohr (1980) noted that many of the young subjects of his study were at a disadvantage when he realized they "apparently did not understand the concepts of same and different, whether applied to music, shapes, or colors" (p. 223). Validity of the testing instrument was called into question for five-year-old children since the *PMMA* requires the subjects to decide if patterns are the same or different. While Elliott recommended that further efforts be made to create more appropriate music aptitude tests for kindergarten children, it seems plausible that the *PMMA* may be suited to older students with a history of some guided musical experience.

The current study responded to this issue by choosing second-grade students as subjects instead of pre-grade-school children, as was the case in both the Kwiatkowski and the Elliott studies. Considering the pivotal nature of the second grade in terms of music development, and also considering the expectation that children of this age have already experienced two years of public school music instruction, it is reasonable to surmise that a study targeting children at this stage of development might yield results of a greater statistical significance than found in the two previous studies.

Another issue of note in the previous studies was the choice of background music. As previously discussed, Kwiatkowski (2001) cited the lack of diversity in her background music as a possible reason that the results of her study fell short of statistical significance. This explanation seems to be supported by the current research, indicating that children become acculturated to music in the same manner as they do the spoken language (Gordon, 1991; Suzuki, 1998). It therefore seems reasonable that a mixture of styles presenting a variety of music elements would have the greatest impact on musical learning. Elliott (1995) attempted to address this concern by using a variety of music containing contrasts in dynamics, timbre, style, and rhythm in her study, yet her study fell short of statistical significance as well. While Elliott compiled fourteen tapes of music representing a range of diversity in musical elements for her study, there is no evidence to suggest that the tapes were shortened or excerpted; in fact, some of the selections were over ten minutes long, thus limiting exposure to the variety of musical elements in the tapes. Elliott expressed concerns that her choices of lengthy background music selections may have negatively impacted the outcome of her study.

Gordon published a series of background music tapes entitled *Jump Right In To Listening: Music For Young Children* (1991) that have maximized the diversity in the musical elements by providing "short selections, each none more than three minutes long [*with*] great contrasts in dynamics, timbre, style and rhythm" (1991). To this end, the current research project included an assortment of musical pieces from Gordon's background music tapes comprised of short selections of music or musical excerpts containing a wide range of musical elements, including genres, dynamics, tempi, instrumentation, and rhythmic and melodic variations. Background music selections in the current study were limited to two CDs, and were no longer than three minutes each, thus ensuring that participants were exposed to multiple repetitions of the widest variety of musical elements possible (see Appendix A for a list of the music selected).

Gordon's (1991) music tapes were also chosen for the current project given the wide selection of classical music presented on the tapes. The choice of classical music for the current study was based on the research citing the positive influences of classical background music on mood and behavior (Chalmers, 1999; Hallam et al., 2002; Koppelman & Imig, 1995; Seda, 2009), and as such, might render the students more receptive to the benefits of background music. Additionally, the literature (see Gordon, 1991; Suzuki, 1998) indicated that because children become acculturated to music in the same manner as they do the spoken language, a mixture of styles presenting a variety of music elements would have the greatest impact on musical learning.

The musical excerpts (see Appendix A) were edited for overuse of extremes in tempi based on the findings of Chalmers et al. (1999) indicating that music played at

sixty beats per minute is optimal for encouraging a state of relaxation, thereby positively affecting focus and concentration. As per the research indicating that behavior can be influenced by background music (Brown & Volgsten, 2006; Chalmers et al., 1999; Griffin, 2006; Hallam et al., 1998; Hargreaves et al., 2005; Koppelman & Imig, 1995; McGovern, 2000; Seda, 2009), the selections also were edited for overuse of extremes in other musical elements as well, e.g., dynamics, use of vocals, rhythmic complexities, dense orchestrations, and wide swings in tonality. The editing was performed with the intention of minimizing equally wide reactions in participants in order to ensure that the classroom environment remained stable.

Participants

Participants in the study consisted of sixty second-grade students in four different classes. The male/female ratio was constant within the sample, with an age range of seven to eight years old. Base knowledge consisted of identical music instruction in general music classes for all students. Each of the four classes was randomly assigned to either the treatment group or the control group by casting a die.

Enrollment. According to the school's database, the school's enrollment was 511 students, with 317 students (62%) considered to be economically disadvantaged. The designation of 'economically disadvantaged' was based on the student population that qualified for either a free or reduced-price lunch in the cafeteria. The breakdown by grade included 106 kindergarten students, eighty-eight first-grade students, seventy-two second-grade students, seventy-eight third-grade students, eighty-two fourth-grade students, and eighty-six fifth-grade students (see Table 1 for a breakdown of the racial

Table 1
Comparison of Demographics

Students	Class A	Class B	Class C	Class D
Number of Students	14	16	15	15
Girls	10 (71%)	8 (50%)	11 (73%)	9 (60%)
Boys	4 (29%)	8 (50%)	4 (27%)	6 (40%)
Hispanic	4 (28.5%)	5 (31%)	7 (46.5%)	5 (33.5%)
White	4 (28.5%)	5 (31%)	5 (33.5%)	5 (33.5%)
African American	4 (28.5%)	4 (25%)	3 (20%)	4 (26.5%)
Asian	2 (14.5%)	2 (13%)	0 (13.5%)	1 (6.5%)

and gender demographics for the participating second-grade students.). Based on the demographic percentages, the two groups can be considered demographically homogeneous.

Ethical Treatment. Information regarding the nature of the study and confidentiality was communicated via Institutional Review Board (IRB) Consent to Participate forms (see Appendix B) and Assent to Participate forms (see Appendix C). Signed forms were collected prior to the commencement of the study. Neither the questionnaires nor the music aptitude tests included names of students. All tests were scored by music educators within the district.

Instrumentation

All second-grade classes offered a thirty-minute arrival session that included daily classroom chores followed by a Morning Meeting consisting of socializing, sharing, and group play. Additionally, all classes offered a thirty-minute session in the afternoon

during which time students prepared for dismissal. Background music was played in two of the four classes every day during this time for a total of sixty minutes per day, five days per week, for fourteen weeks. Both teachers in the experimental group played their CDs through identical classroom Promethean boards. Music in both classes was played on a consistently soft setting so as to be audible without being noticeably distracting. It was estimated that volume levels were set at approximately 40 decibels. Teachers were given instructions prior to the commencement of the study (see Appendix D).

The standardized test employed in this study was Edwin Gordon's *Primary Measures of Music Audiation* (*PMMA*, 1979) test. The *PMMA* test was chosen as a measure of music aptitude for the current research project because the test is said to exemplify the highest standards for validity and reliability in music aptitude assessments (Walters, 1991). The content validity, construct validity and process validity of the instrument are addressed in Gordon's Manual (1986), in which Gordon lists each test question and the percentages of students who responded correctly (see pp. 61-65). In addition, Gordon presents detailed information on the content validity and concurrent validity of the tests (see pp. 97-109). Specifically, Gordon established content validity by showing that sixty percent of all item intercorrelations were statistically significant at a value of .30 or higher. Concurrent validity was demonstrated by Gordon when he showed statistically significant and positive correlations between the *PMMA* and the Metropolitan Readiness Test, the Stanford Achievement Test, and the Lorge Thorndike Verbal and Nonverbal Intelligence Tests.

Split-half reliability for the tonal test is .89, for the rhythm test is .86, and for the composite score is .92. Test-retest reliability is .70 for the tonal test, .73 for the rhythm test, and .76 for the composite score. The standard error of difference is 2.3 for the second grade (Gordon, 1986, p. 91).

The *PMMA* is comprised of two subtests: Tonal and Rhythm. Each subtest is recorded separately onto cassette tapes. The test is prerecorded and specifically designed to evaluate groups of children. The tasks include an aural comparison of two short musical excerpts, and students are required to determine the similarity or difference between the two. The music heard on the test was recorded with a synthesizer because according to Gordon (1986), "young children are more attentive when listening to electronic instruments as opposed to actual musical instruments" (pp. 8-9). Additionally, according to Gordon, the reliability of both subtests increases dramatically with the use of a synthesizer versus a standard musical instrument. Each recording includes practice examples and forty test questions of short musical phrases, requiring approximately twenty minutes to complete. The answer sheets are designed so that any child can take the test regardless of his or her reading skills, number-recognition skills, or prior musical knowledge.

Further, the test is child-friendly. As Gordon (1981) notes, students do not need to know how to read music notation or even read script in order to successfully navigate through the *PMMA*; instead, students simply respond to music examples by circling similar or dissimilar pictures on the test sheet to identify similar or dissimilar tonal and rhythmic prompts. The *PMMA* is also recommended by Gordon for the age group of

children in the current study, specifically second-grade students who are approximately seven and eight years of age. Finally, the test is brief–only twenty or twenty-five minutes in duration for each subtest. Given the time constraints of the public school music teacher, a brief assessment made it possible to test a large group of children without unduly compromising instructional time.

Because existing research indicates that a child's music preference may influence his or her response to the background music chosen (Chamorro-Premuzic et al., 2009; Furnham & Allass, 1999; Furnham & Strbac, 2002), a Music Preference Questionnaire (MPQ) was administered to all participants of the treatment group after the experiment was completed to determine student response to the music that was played (see Appendix E). The questionnaire presented the question, "Did you like the music played in your classroom?" Possible responses included 'yes,' 'no,' or 'not sure.' The simplicity of the questionnaire ensured that it was easily understood by children. The use of the MPQ was in response to the current research indicating that music preferences may sway student response to background music (Chamorro-Premuzic et al., 1999; Furnham & Strbac, 2002). The data were compared with posttest composite scores to investigate the possibility that musical preference impacts rhythmic and tonal pattern recognition and recall. The MPQ was modeled after the questionnaire utilized in the study conducted by Kwiatkowski (2001) in which she investigated the influence of children's background music preferences on rhythm discriminatory ability.

Procedures

The following sections describe the procedures followed in this study, including the administration of the pretest and posttests, scoring and statistical analysis.

Pretest and Posttest

Gordon (1986) recommends that the Tonal subtest be administered on one day and the Rhythm subtest on another; he further recommends that the two tests be administered less than a week apart. The pretests (i.e., Tonal and Rhythm subsections of the *PMMA*), therefore, were administered in February on separate days during the week prior to the start of the experiment, and the posttests were administered in June on separate days during the week immediately following the completion of the experiment. The testing took place on the stage of the school auditorium where students usually have their music classes. While the researcher administered the tests, the co-teacher received prior instructions as to how to monitor and facilitate the testing. Students who declined to participate were kept occupied in an outside room with quiet word games and puzzles. The Rhythm and Tonal subsections of the *PMMA* were administered two days apart, and the tests were scored immediately. The researcher read the directions to the participants from test kit manual and then administered the test. Test data were recorded on cards provided by the publisher of the test kit.

During the fourteen-week treatment period, the researcher visited each of the two classes assigned to the treatment group once per week to ensure that the background music tape was being played as planned, with volume controls and location of the tape player conforming to expectations. After the treatment period of fourteen weeks, all sixty

students returned to the auditorium for the posttest, at which time the researcher distributed the MPQ to each of the thirty participants in the treatment group to inquire as to whether or not they liked the type of music that was played. To minimize problems with peer pressure and favoritism, students were asked to make their selections confidentially.

Scoring and Data Analysis

Scoring was conducted as per the instructions provided in Gordon's *PMMA* and *IMMA* Music Audiation manual (1986). The tests generate a Tonal score, a Rhythm score, and a Composite score. On completion, the results yield two types of scores: the raw scores and the percentile ranks. The raw score consists of the number of questions answered correctly. Because the *PMMA* only comprises two subtests each, the raw scores can be directly translated into percentile ranks without loss of accuracy in interpretation. Tables are provided within the manual for conversion and interpretation of scores, including percentile rank norms. All data were scored by hand using the scoring mask provided with the testing materials. Raw scores were converted into percentile ranks using the tables found in the test manual.

Statistical analysis was conducted using IBM SPSS predictive analytics software, version 20 (IBM Corp., 2011). Statistical results are discussed in the next chapter.

Chapter Four

Results

The data presented in this chapter were obtained from the analyses performed on the raw and percentage tonal, rhythm and composite scores generated by the *Primary Measures of Music Audiation* (*PMMA*) for all participants, and the Music Aptitude Questionnaire (MPQ) completed by the participants in the music treatment group. Participants were compared according to group designation (music treatment versus no music treatment) and pretest/posttest scores on the *PMMA*. A two-way Repeated Measures Analysis of Variance (ANOVA) was conducted to determine if the *PMMA* data varied over time as a function of exposure to music. This test included a check among subsets of students with high music aptitude versus low-to-average music aptitude as determined by the pretest *PMMA* scores to detect if differences of statistical significance were present between the treatment group and the control group at the .05 alpha level.

This chapter is organized into three subsections. The first subsection provides descriptive statistics for all variables used in the current project. Subsections two and three provide the inferential statistical results associated with the two central research questions. The research questions that guided this investigation are as follows:

1. What is the extent of the relationship between exposure to repetitive background music and music pattern recognition scores among second-grade children?
2. What is the extent of the relationship between musical preference and music pattern recognition scores among second-grade children?

Table 2
Means and Standard Deviations for All Variables Used in the Analyses

Variable	Mean	SD
Gender (1=female)	0.63	0.49
Race or ethnicity (1=White)	0.32	0.44
Race or ethnicity (1=Black)	0.25	0.47
Race or ethnicity (1=Hispanic)	0.35	0.48
Race or ethnicity (1=Asian)	0.08	0.28
High versus low-to-average music aptitude (1=high)	0.38	0.49
Music present in a class (1=yes)	0.50	0.50
Students in Class A (1=yes)	0.23	0.43
Students in Class B (1=yes)	0.27	0.45
Students in Class C (1=yes)	0.25	0.44
Students in Class D (1=yes)	0.25	0.44
Preferred music (1=yes; n=30)	0.77	0.43
Tonal raw score, February	31.47	4.99
Tonal raw score, June	32.02	4.89
Tonal percentile score, February	50.83	25.75
Tonal percentile score, June	53.77	27.31
Rhythm raw score, February	30.05	5.18
Rhythm raw score, June	30.52	4.08
Rhythm percentile score, February	61.82	26.86
Rhythm percentile score, June	63.80	22.82
Composite raw score, February	61.37	9.18
Composite raw score, June	62.45	7.71
Composite percentile score, February	57.73	26.69
Composite percentile score, June	60.40	24.17

Note: n=60 unless otherwise indicated.

Descriptive Statistics

Table 2 provides the means, standard deviations and percentages for each of the variables that were used in the current investigation. As can be seen in Table 2, two out of every three of the students in the study (sixty-three percent) were female. With respect to racial or ethnic identity, roughly two thirds of the students were either Hispanic

(thirty-five percent) or White (thirty-two percent). One in every four students was African American (twenty-five percent), and the remaining eight percent of students was Asian. The distribution of students in each classroom was fairly symmetric; fourteen students (or twenty-three percent) comprised Class A, while sixteen students (or twenty-seven percent) comprised Class B. Classes C and D both contained a total of fifteen students. It should be noted that Classes A and B were exposed to the treatment of background music. Classes C and D comprised the control group and therefore received no background music treatment. Among those students who were exposed to music (n=30), roughly three out of every four (seventy-seven percent) stated that they liked the music. Finally, thirty-eight percent of all students tested as having high music aptitude.

Research Question 1

With respect to the first research question, the researcher sought to determine the extent of the relationship between consistent exposure to background music and music pattern recognition scores among second-grade children. Prior to examining this question via multivariate tests, a series of bivariate tests (i.e., independent samples t-tests and oneway ANOVAs as appropriate) was conducted to determine if the six primary variables of interest (i.e., the tonal raw and percentile scores for February and June, the rhythm raw and percentile scores for February and June, and the composite raw and percentile scores for February and June) varied as a function of possible statistical confounds. Results of the independent samples t-tests[1] suggest that there were no

[1] For purposes of brevity, the results of all non-significant bivariate tests will not be described here. Nevertheless, the results of these tests are available from the author upon request.

Table 3
Independent Samples t-Test of High versus Low-to-Average Music Aptitude on Tonal, Rhythm and Composite Scores

	High Music Aptitude		Low-to-Average Music Aptitude		
	M	SD	M	SD	*t*
Tonal Raw Score February	35.22	2.39	29.14	4.77	5.677***
Tonal Raw Score June	35.96	2.44	29.57	4.41	7.285***
Tonal Percentile Score February	73.22	17.83	36.92	19.32	4.971***
Tonal Percentile Score June	78.87	16.50	38.16	20.07	4.931***
Rhythm Raw Score February	33.61	4.66	27.84	4.19	6.442***
Rhythm Raw Score June	33.04	3.90	28.95	3.37	7.680***
Rhythm Percentile Score February	80.17	24.16	50.41	21.82	6.360***
Rhythm Percentile Score June	77.74	20.61	55.14	19.81	8.157***
Composite Raw Score February	68.83	5.61	56.73	7.83	4.312***
Composite Raw Score June	69.00	4.78	58.38	6.24	4.233***
Composite Percentile Score February	81.57	17.92	42.92	19.55	6.984***
Composite Percentile Score June	81.70	12.74	47.16	19.70	7.478***

Note: n=60. df=58. *=p<.05, **=p<.01, ***=p<.001.

differences in tonal, rhythm, and composite scores as a function of gender. The outcome of a series of oneway ANOVA equations revealed similar results with respect to the race of a student; specifically, there were no differences in tonal, rhythm and composite scores as a function of the race of a student. A series of oneway ANOVA equations also showed that no tonal, rhythm and composite scores varied due to the particular teacher to which a student was assigned. Results of a series of independent samples t-tests did suggest that there was a statistically significant difference in all time periods for all tonal, rhythm and composite scores between those students with high music aptitude versus

low-to-average music aptitude. Table 3 shows that the average tonal, raw and composite scores for those students with high music aptitude were statistically greater than the average scores for those students with low-to-average music aptitude.

Based on this information, the decision was made to use high versus low-to-average music aptitude as a statistical control in the two-way Repeated Measures ANOVA equations that were used to investigate Research Question 1. In all, six different two-way Repeated Measures ANOVA equations were constructed to determine whether or not exposure to music over time influenced tonal raw scores, tonal percentile scores, rhythm raw scores, rhythm percentile scores, composite raw scores and composite percentile scores. Each of these six equations included the student classifications of high music aptitude versus low-to-average music aptitude as a statistical covariate. Results of the two-way Repeated Measures ANOVA calculations suggested that background music did not affect tonal raw scores between February and June ($F(1,57) = 0.605$ $p = .440$), tonal percentile scores between February and June ($F(1,57) = 0.173$, $p = .679$), rhythm percentile scores between February and June ($F(1,57) = 2.679$, $p = .107$), composite raw scores between February and June ($F(1,57) = 3.833$, $p = .055$), or composite percentile scores between February and June ($F(1,57) = 2.650$, $p = .109$). Statistical results of the two-way Repeated Measures ANOVA equations revealed one finding of note: the average rhythm raw score did change over time as a function of exposure to background music ($F(1,57) = 4.364$, $p = .041$; Wilks' Lambda = 0.929). Specifically, the average scores for those students who were exposed to music in February ($M=30.70$, $SD=5.46$) increased by June ($M=31.27$, $SD=4.11$). Although the increase in the group that was

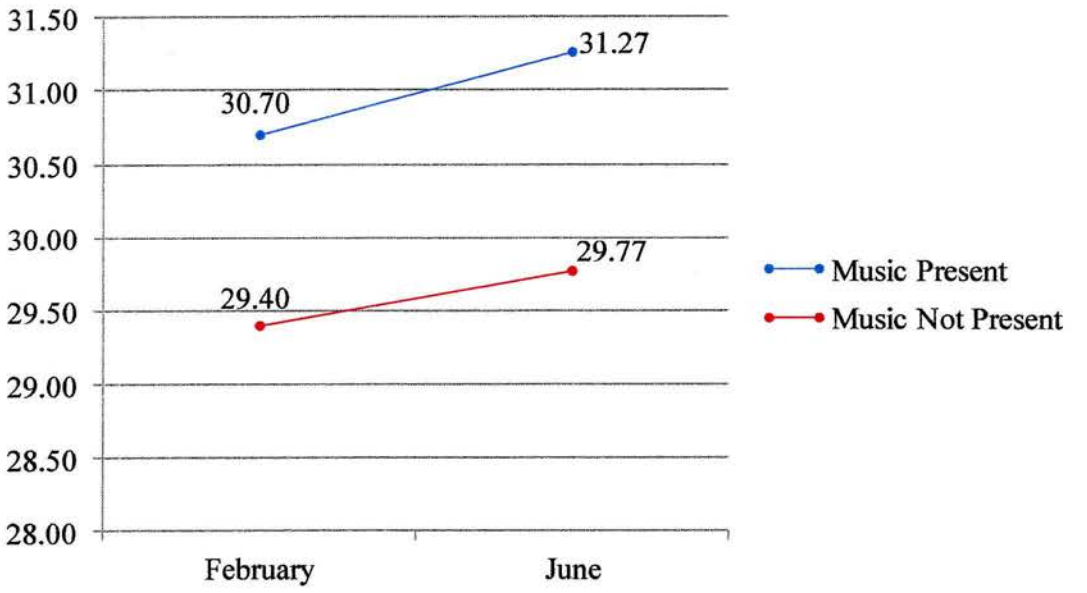

Figure 1. Rhythm Raw Scores across Time (n=60)

exposed to music was modest (.57), it was significantly different from the increase in the control group (.37). Figure 1 provides a graphical overview of this increase over time. When taken together, this information suggests that exposure to background music raised the rhythm raw scores of second-grade students over time, controlling for whether or not a child demonstrated high versus low-to-average music aptitude.

In order to fully investigate the differences between high versus low-to-average music aptitude in second-grade students, the overall dataset was segmented into two new datasets that were mutually exclusive with respect to music aptitude. Specifically, the first new dataset (n=23) contained only those students with high music aptitude; the second new dataset (n=37) contained only those students with low-to-average music aptitude. Once separated, the two new datasets were subjected to the same two-way

Repeated Measures ANOVA equations which were conducted on the entire dataset to determine if differences in tonal, rhythm and composite scores existed within the separated datasets.

Results of the two-way Repeated Measures ANOVA calculations among only the students with high music aptitude suggest that the presence of background music did not affect tonal raw scores between February and June ($F(1,21) = 1.365$ $p = .256$), tonal percentile scores between February and June ($F(1,21) = 1.403$, $p = .250$), rhythm raw scores between February and June ($F(1,21) = 0.548$, $p = .467$), rhythm percentile scores between February and June ($F(1,21) = 0.302$, $p = .588$), composite raw scores between February and June ($F(1,21) = 0.072$, $p = .791$), or composite percentile scores between February and June ($F(1,21) = 0.033$, $p = .857$). When taken together, it can be concluded that exposure to background music did not appear to have a statistically significant effect on second-grade students demonstrating high music aptitude.

Among the students with low-to-average music aptitude, results of the two-way Repeated Measures ANOVA calculations suggest that the presence of background music did not affect tonal raw scores between February and June ($F(1,35) = 0.477$ $p = .494$), tonal percentile scores between February and June ($F(1,35) = 0.168$, $p = .684$), rhythm percentile scores between February and June ($F(1,35) = 2.718$, $p = .108$), composite raw scores between February and June ($F(1,35) = 3.568$, $p = .067$), or composite percentile scores between February and June ($F(1,35) = 2.638$, $p = .113$). Statistical results of the two-way Repeated Measures ANOVA equations did find that the average rhythm raw scores among low-to-average music aptitude students changed over time as a function of

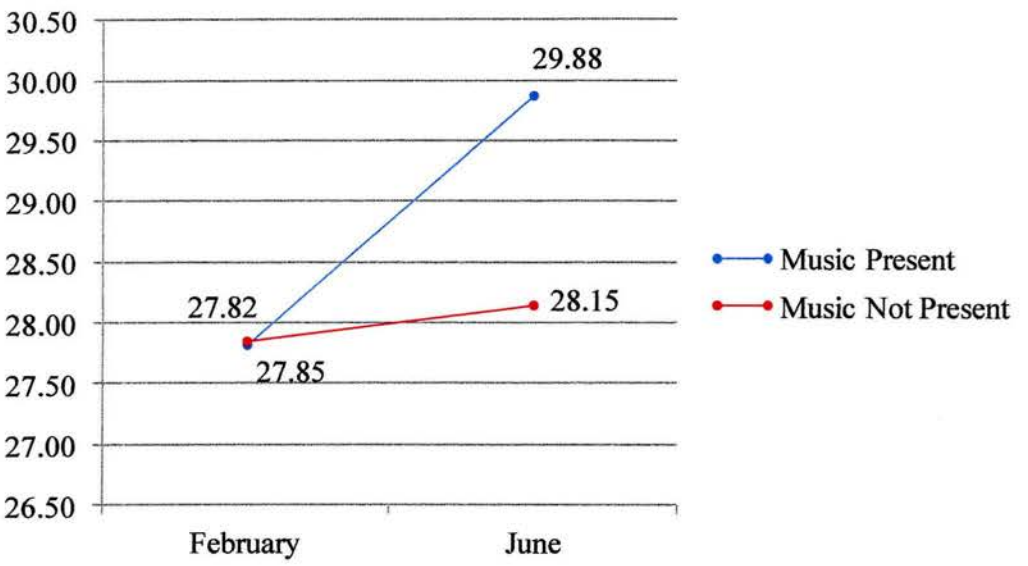

Figure 2. Rhythm Raw Scores across Time (n=37).

exposure to background music (F (1,35) = 4.575, p = .039; Wilks' Lambda = 0.884). Specifically, the average scores for those students who were exposed to music in February (M=27.82, SD=4.81) increased by June (M=29.88, SD=3.37).

In contrast to the results seen with the entire dataset, the increase in the group of children with low-to-average music aptitude that was exposed to music is much more pronounced (2.06). This increase is significantly different as compared to the increase in the group with high music aptitude (p<.30). Figure 2 provides a graphical overview of this increase over time.

When taken together, the entirety of this information suggests that exposure to background music raised rhythm raw scores over time for those second-grade students who evidenced low-to-average music aptitude. Exposure to background music did not appear to have an effect on students demonstrating high music aptitude.

Research Question 2

The second research question investigated whether or not a relationship exists between music preference and music pattern recognition scores among second-grade children. Prior to examining this question via multivariate tests, a series of bivariate tests (i.e., independent samples t-tests and oneway ANOVAs as appropriate) was conducted to see if the six primary variables of interest (i.e., the tonal raw and percentile scores for February and June, the rhythm raw and percentile scores for February and June, and the composite raw and percentile scores for February and June) varied as a function of possible statistical confounds. Results of the independent samples t-tests[2] suggested that there were no differences in tonal scores, rhythm scores and composite scores as a function of gender. The outcome of a series of oneway ANOVA equations revealed similar results with respect to the race of a student; specifically, there were no differences in tonal, rhythm and composite scores as a function of race. Independent samples t-tests also showed that no tonal, rhythm and composite scores varied due to the particular teacher to which a student was assigned.

Results of a series of independent samples t-tests suggested that there was a statistically significant difference in all time periods for all tonal, rhythm and composite scores between students with high music aptitude versus students with low-to-average music aptitude. Table 4 provides evidence that the average tonal, raw and composite scores for students demonstrating high music aptitude were statistically greater than the

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[2] As previously with Research Question 1, for purposes of brevity the results of all non-significant bivariate tests will not be described here. Nevertheless, the results of these tests are available from the author upon request.

Table 4
Independent Samples t-Test of High versus Low-to-Average Music Aptitude on Tonal, Rhythm and Composite Scores for Students Exposed to Music

	High Music Aptitude		Low-to-Average Music Aptitude		
	M	SD	M	SD	*t*
Tonal Raw Score February	35.31	2.81	28.24	5.69	4.106***
Tonal Raw Score June	36.31	2.66	28.71	5.29	4.922***
Tonal Percentile Score February	72.92	21.12	34.29	21.43	4.104***
Tonal Percentile Score June	80.92	17.61	35.94	21.06	4.216***
Rhythm Raw Score February	34.46	3.76	27.82	4.81	4.606***
Rhythm Raw Score June	33.08	4.46	29.88	3.31	5.948***
Rhythm Percentile Score February	84.08	17.99	51.29	23.17	4.732***
Rhythm Percentile Score June	76.69	22.60	59.65	20.31	6.212***
Composite Raw Score February	69.77	4.44	56.06	9.97	2.253***
Composite Raw Score June	69.38	5.53	58.59	6.69	2.170***
Composite Percentile Score February	84.54	12.45	43.06	22.60	4.711***
Composite Percentile Score June	81.77	13.97	48.12	21.16	4.958***

Note: n=30. df=28. *=p<.05, **=p<.01, ***=p<.001.

average scores for students with low-to-average music aptitude.

As with Research Question 1, on the basis of this information, the decision was made to use high versus low-to-average music aptitude as a statistical control in the two-way Repeated Measures ANOVA equations that were used to investigate Research Question 2. In all, six different two-way Repeated Measures ANOVA equations were constructed to determine whether or not musical preference influenced tonal raw scores, tonal percentile scores, rhythm raw scores, rhythm percentile scores, composite raw scores and composite percentile scores over time. Each of these six equations included

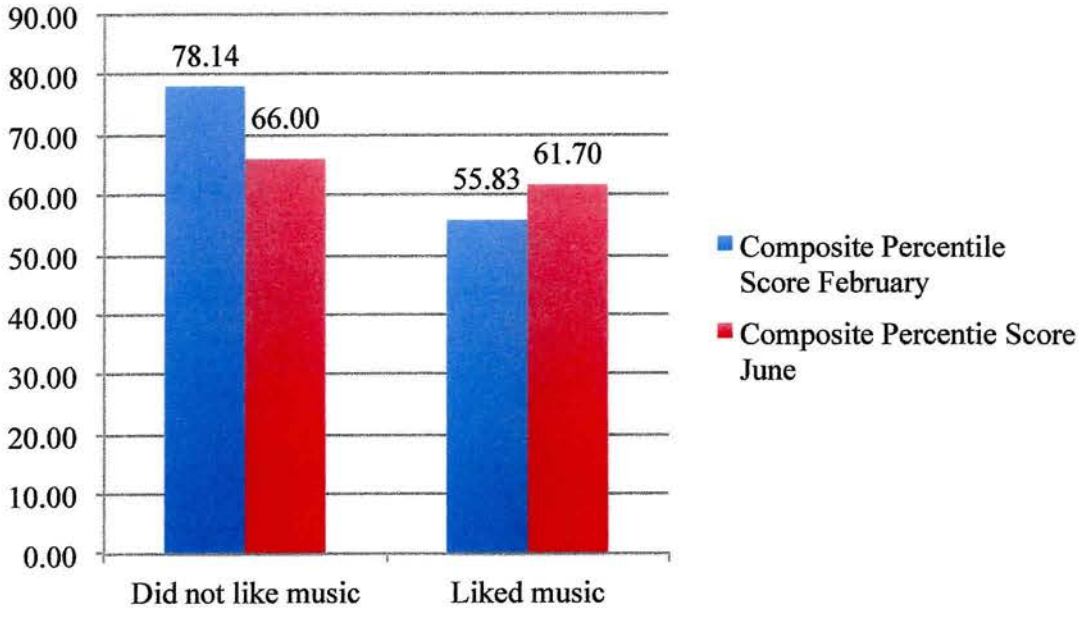

Figure 3. Interaction of Composite Percentile Score and Music Preference.

the student classifications of high music aptitude versus low-to-average music aptitude as a statistical covariate. Results of the two-way Repeated Measures ANOVA calculations suggested that the presence of background music did not affect tonal raw scores between February and June ($F(1,27) = 0.142$ $p = .709$), tonal percentile scores between February and June ($F(1,27) = 0.321$, $p = .576$), or composite raw scores between February and June ($F(1,27) = 0.045$, $p = .833$).

A statistically significant interaction between composite percentile scores from February to June and music preference was detected within the data ($F(1,28) = 5.966$, $p = .021$; Wilks' Lambda = 0.824). When exposure to music over time was taken into account, there was a difference in the composite percentile score data between February and June. It is important to note that the nature of the statistical difference over time is an

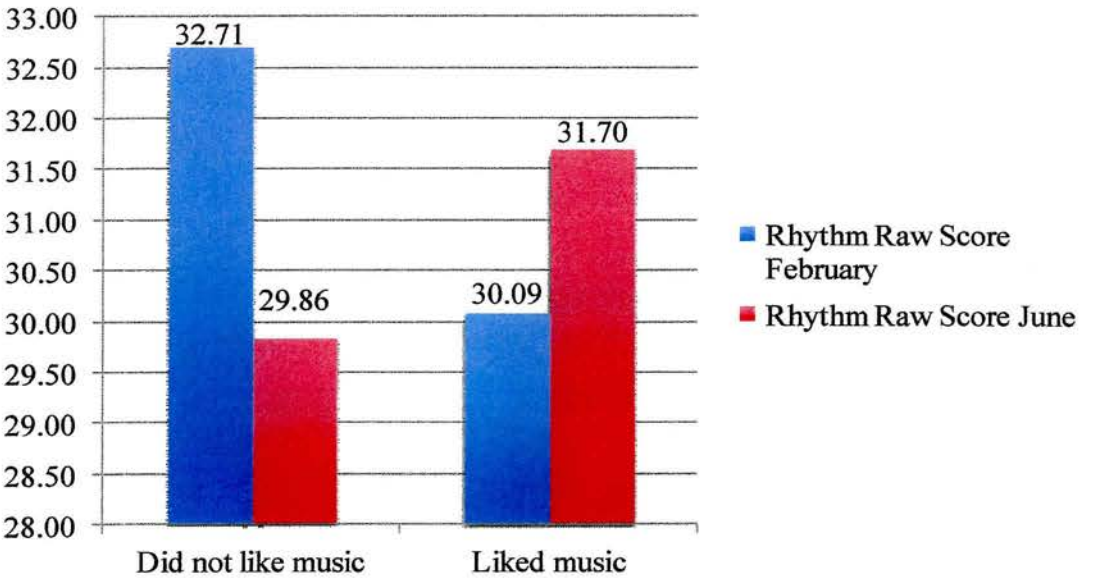

Figure 4. *Interaction of Rhythm Raw Score and Music Preference.*

interaction effect; in other words, the change in preference scores was altered as a function of time. Decomposition of the interaction effect suggests that average composite percentile scores for those who did not like the music decreased from February (M=78.14, SD=14.35) to June (M=66.00, SD=10.07); in contrast, the same scores increased from February (M=55.83, SD=29.23) to June (M=61.70, SD=27.91) for those who liked the music. Figure 3 on the previous page provides a graphical representation of this interaction effect.

Statistically significant interaction effects over time were also detected within the data between both rhythm raw scores and music preference ($F(1,28) = 8.636$, $p = .007$; Wilks' Lambda = 0.770), as well as rhythm percentile scores and music preference ($F(1,28) = 8.128$, $p = .008$; Wilks' Lambda = 0.775). When exposure to music over time

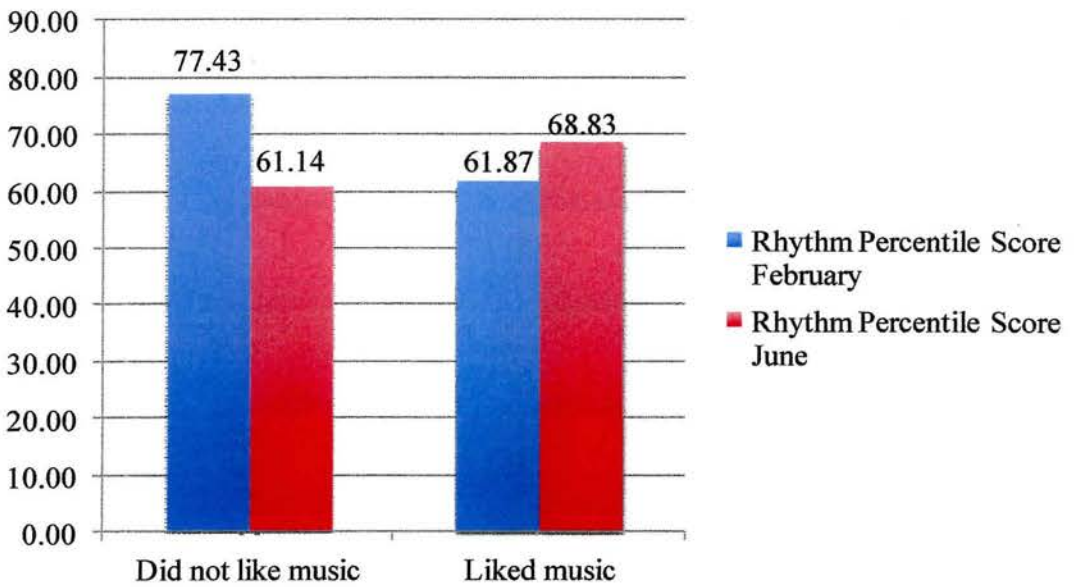

Figure 5. Interaction of Rhythm Percentile Score and Music Preference.

was considered, a statistical difference emerged in the rhythm raw and percentile score data between February and June. It is important to note that the nature of the statistical preference scores was again an interaction effect; in other words, the change in preference scores was altered as a function of time. Decomposition of the interaction effect for rhythm raw scores in Figure 4 on the previous page suggested that average scores decreased from February (M=32.71, SD=2.69) to June (M=29.86, SD=2.61) among students who did not like the background music. In contrast, rhythm raw scores increased from February (M=30.09, SD=5.98) to June (M=31.70, SD=4.43) among students who did like the background music. A similar pattern was found with respect to rhythm percentile scores in Figure 5. Specifically, rhythm percentile scores decreased from February (M=77.43, SD=14.54) to June (M=61.14, SD=15.66) among students who did not like the background music. In contrast, Rhythm Percentile Scores increased from

February (M=61.87, SD=28.46) to June (M=68.83, SD=24.38) among students who did like the background music.

When taken together, the entirety of the data provided suggests that among those students who were exposed to background music, preference dictated composite percentage scores, rhythm raw scores and rhythm percentage scores over time. Specifically, students who liked the background music earned higher composite percentile, rhythm raw and rhythm percentile scores over time; those students who did not like the music saw their composite percentile, rhythm raw and rhythm percentile scores decrease.

Chapter Five

Summary, Conclusions, and Recommendations

Summary

The purpose of this study was to examine the effect of background music on second-grade children's rhythmic and tonal pattern recognition skills. The specific areas of investigation were the relationship between exposure to repetitive background music and music pattern recognition skills, as well as the relationship between musical preference and music pattern recognition skills.

Two control groups and two experimental groups, each comprised of thirty participants, were randomly assigned from four existing second-grade classes. The fourteen-week background music regimen administered to the experimental group included selections from Edwin Gordon's compilation tape entitled *Jump Right In To Listening: Music For Young Children* (1991). The music selections contained a group of brief excerpts offering a variety of contrast in style, timbre, dynamics, and rhythm (a complete list of excerpts is provided in Appendix A).

The *Primary Measures of Music Audiation (PMMA*) was administered as a pretest to all sixty participants. In the fourteen weeks that followed, the experimental group heard background music in the classroom each day for thirty minutes during arrival time, and thirty minutes at the end of the day during dismissal time, for a total of sixty minutes per day, five days per week. The control group heard no music during arrival or dismissal times.

After a period of fourteen weeks, all participants were retested using the *PMMA* in order to determine if differences in rhythmic and tonal pattern recognition skills existed between the control group and the experimental group. Additionally, surveys addressing the issue of music preference were distributed at the end of the fourteen weeks to the students in the experimental group, as existing research indicated that children's music preferences may influence their response to music (Chamorro-Premuzic et al., 1999; Furnham & Strbac, 2002).

A two-way Repeated Measures ANOVA was used to analyze the statistical data as part of this investigation. Analysis of the *PMMA* scores revealed statistically significant differences on the rhythm test between the control group and the experimental group in the subset of participants with low-to-average music aptitude. Differences of statistical significance were also found between the composite percentile, rhythm raw and rhythm percentile scores of those participants in the experimental group who professed to like the music versus those who professed to dislike the music.

Findings

The statistically significant results of this study suggest the following: a) those participants who possessed low-to-average music aptitude benefited from the background music program in the area of rhythmic pattern recognition skills; and b) those participants who liked the background music performed better on the rhythm test of the *PMMA* as compared to those participants who disliked the music.

On first examination, the results of the basic bivariate statistical analyses on the *PMMA* test scores in the area of tonal and rhythmic pattern recognition skills revealed no

significant effect in either area. The independent samples t-tests and the one-way ANOVA tests that focused on elements of race, gender and classroom to which a student was assigned revealed no statistically significant differences. These original results matched the findings of the Elliott (1995) study, where after exposure to a fourteen-week music background program, the participants evidenced no statistically significant improvements in music aptitude. However, once additional tests were conducted in the current study to determine if there were any differences in test scores between the subset of students who possessed high music aptitude versus the students who possessed low-to-average music aptitude, results of modest statistical significance emerged. Specifically, it was revealed that students who possess low-to-average music aptitude in the treatment group scored significantly higher on the posttest as compared to those students who possess high music aptitude.

The initial results of the statistical tests conducted on the preference data were similar. When initial bivariate independent samples t-tests were conducted to determine if any significant changes in *PMMA* test scores existed in the experimental group in the area of tonal and rhythmic pattern recognition skills as a function of student preference or aversion to the background music, there were no differences of statistical significance to report. Even bivariate oneway ANOVA and independent samples t-tests that included elements of race, gender and classroom to which a student was assigned revealed no statistically significant differences. Once additional multivariate statistical tests were conducted to determine any differences in test scores as a function of music preference between the subset of students possessing high music aptitude versus students possessing

low-to-average music aptitude, results of statistical significance were revealed. Specifically, it was found that students possessing low-to-average music aptitude who liked the background music scored significantly higher on the posttest in the area of composite percentile, rhythm raw and rhythm percentile over time. Those students who disliked the music saw a decline in their composite percentile, rhythm raw and rhythm percentile scores over time. These findings lie in opposition to the findings of the Kwiatkowski (2001) study, in which she reported that the participants' professed music preference had no impact on *PMMA* scores.

The results of the current study suggest the following a) a consistent background music program for second-grade children who possess low-to-average music aptitude, with background music offering diversity in musical elements, will benefit children in the area of rhythm pattern recognition skills over time; b) a consistent background music program that is pleasing to the listener will enhance music aptitude performance in the area of rhythm pattern recognition skills in second-grade children over time; and c) a background music program that is displeasing to the listener will interfere with music aptitude performance in the area of rhythm pattern recognition in second-grade children over time.

Conclusions

With a multitude of studies available today examining the effects of background music on performance in math, language and spatial abilities (Anderson et al., 2010; Hallam et al., 2002; Koppelman et al., 1995; Rauscher et al., 1993; Savan, 1999), a cursory perusal of the research reveals a shortage of studies investigating the effects of

background music on children's rhythmic and tonal pattern recognition, and particularly on the subsets of children identified as demonstrating high versus low-to-average music aptitude. As such, the current study is both unique and pertinent, and the findings have substantial implications. The findings associated with the current study suggest the following points:

First, passive listening to background music will have an effect on the rhythm pattern recognition skills in children in the developmental stage of music aptitude in the subset of low-to-average music aptitude. Considering the fact that the Kwiatkowski (2001) and Elliott (1995) studies failed to generate a similar effect, however, it would appear that certain conditions need to be met concerning this result:

1. Listeners need to be of an age where they have acquired some music learning, thus establishing some context in which to frame that which the listeners hear. Gordon (1989) maintains that the younger a child, the more likely it is that his or her music aptitude can be developed. Gordon went on to identify what he considered to be appropriate experiences encouraged by parents, such as singing and response to rhythm. These are deliberate, participatory activities as opposed to passive absorption of elements. When Elliott conjectured as to possible reasons her study revealed no main effect, she explained that the pre-grade-school participants in her study were still in what Edwin Gordon describes as the 'music babble stage,' which is the developmental stage occurring between birth and approximately five years of age in which a child has yet to develop any sense of meter or tonality. It seems likely that when Gordon offered his recommendations

regarding the optimal age for children to develop music aptitude, he was referring to children encountering direct, interactive music experiences. It therefore seems plausible to argue that a learning technique as subtle as passive listening requires prior music experiences of the listeners if listeners are to reap benefits.

2. Background music selections need to be brief, diverse and repetitive for optimal effect. Both Gordon (1991) and Suzuki (1998) recommend listening programs comprised of a wide variety of music elements. Gordon in particular maintained that the brevity of music included in his tape entitled *Jump Right In To Listening: Music For Young Children* (1991) guaranteed that listeners were exposed to the widest variety of patterns presented in the background music. Both Elliott and Kwiatkowski expressed concerns about the music regimen in their studies; indeed, it appears that Elliott's lengthy music tapes and selections limited the possibility for repeated exposure to a wider variety of musical elements, and that Kwiatkowski's choice to play Bach exclusively deprived the listeners of the diversity necessary to derive a tangible benefit.

It is important to consider that a background music regimen for elementary students may not reveal immediate results in music pattern recognition skills, but it may at least provide a springboard for music learning and preference. As Elliott (1995) noted, just as children acquire language skills from exposure to language, children may also absorb knowledge of music syntax through its presence in the environment. Thus, a consistent background music program during early a child's elementary years might help to produce higher music aptitude scores later on.

Second, preference of background music appears to improve rhythm pattern recognition skills in children in the developmental stage of music aptitude in the subset of low-to-average music aptitude. In contrast, aversion to background music appears to impede rhythm pattern recognition skills in children in the developmental stage of music aptitude in the subset of low-to-average music aptitude. Since there appears to be no data in the extant literature linking preference/aversion of music to gains/losses in music aptitude, the current study represents one of the first to engage the subject matter. As such, this area of inquiry requires more research before any definitive conclusions can be reached. This is especially true given that the research in the extant literature linking music preference/aversion with mood and task performance in the past has produced mixed results. Adriano (2010), for example, maintained that students who professed to like rap and heavy metal tended to be lower performers in English and mathematics, while McGovern (2000) on the other hand noted that students who professed to like the classical background music played for them behaved better in class, moved through transitions more smoothly, and focused more effectively on the tasks at hand. These contradictions in results raise questions about children's reported music preferences; in fact, it may be the case that music preferences are influenced by a multitude of factors, including peer pressure. As Berndt (1979) maintains, children as young as the third grade are vulnerable to peer pressure; therefore, it is plausible to argue that the tendency for children to profess a preference for the more popular styles of music to which their friends are listening over more soothing music, such as certain selections of classical music, could be nothing more than an indicator of a desire for peer approval.

Unfortunately, it is impossible to know this for certain without further investigation. Classroom teachers from the experimental group in the current study noted that those students who professed to dislike the music were seen staring into space, hanging their heads, and quietly covering their ears. These same children were among those whose music aptitude scores declined over time. In contrast, the children who claimed to like the music were observed unconsciously tapping their feet and humming, and were said to be visibly soothed by the music. These children were among those whose music aptitude scores improved over time. While these results are consistent with the theory that preference for background music can improve music aptitude, the shortage of data on the topic of preferences and music aptitude means that the conclusion reached by Thompson et al. (2001) also seems to be a likely explanation; specifically, that listening to soothing music can encourage a sense of calm and relaxation while improving focus on the task at hand. The subject warrants further investigation.

Recommendations

The following recommendations should be considered by future researchers who wish to study further the effects of background music on the tonal and rhythm pattern recognition skills in children who are still in the developmental stage of music aptitude:

1. Research should continue to examine children past the music babble stage of learning yet still in the developmental stage of music aptitude, specifically ages six through nine, who have acquired a background of guided music experience.
2. Given the shortage of consistent data in the extant literature on the subject of background music preference and task performance, research should continue to

explore the effects of music preference on all aspects of learning, including musical learning.

3. A replication of the current study considering the subject of socioeconomic status might prove to be an interesting area of exploration for future research. Hill (1979) found that culturally advantaged children perform better on tests of music aptitude than do underprivileged children. According to the school's database in the current study, the school's enrollment was 511 students, with 317 students (62%) considered to be economically disadvantaged. Perhaps in a study comprising a more moderate mix of students from both privileged and underprivileged backgrounds, a main effect might emerge in the area of tonal aptitude as well as rhythmic aptitude.
4. A replication of the current study with a larger sample than sixty children would be helpful. The current study was expected to include ninety-two students; however, due to attrition, the final count was limited to only sixty. A study comprising a larger sample might produce more substantial results.
5. A similar investigation to the current study lasting more than fourteen weeks might prove informative. After fourteen weeks, the current study revealed moderately significant results only in the area of rhythm. It is possible that the researcher inadvertently emphasized rhythm studies in the second-grade curriculum, thus enhancing the main effect; however, it is also possible that after addressing the critical points of age and background music in the current study, the element of rhythm was simply the first to emerge. Why rhythm? As noted in

Chapter I, rhythm is the most fundamental music element, inherent in biological function. Chalmers et al. (1999) noted that heart rate and breathing are the most observable physical manifestation of rhythm, but rhythmic patterns are evident even at the cellular level as well. Hargreaves (2001) suggested that rhythmic skills "...are manifested in the earliest stages by different types of physical movement, such as rocking, nodding, see-sawing, and so on" (p. 80). Perhaps we are simply genetically programmed to make connections with rhythm first. Hargreaves also reported that diverging opinions exist as to when exactly skills of tonality emerge, but he cites Moog (1976) in suggesting that "early rhythmic imitations tend to occur before any equivalent imitations of pitch" (p. 81). Elliott (1995) considered the probability that background music produces a more subtle effect than direct instruction on music aptitude; therefore, a study examining the effects of background music longitudinally may be required to reveal a main effect in the areas tonal aptitude as well as rhythmic discriminatory abilities across all levels of music aptitude.

6. A project investigating the differences in response to music between children with high versus low music aptitude might provide more insight on the subject. The results of the current study revealed effects of statistical significance only in the subset of children with low-to-average music aptitude. While a longitudinal study might balance the results to include those children with high music aptitude, it is still noteworthy that those children with low music aptitude were the more receptive to absorbing ambient musical elements.

7. The topic of direct music learning versus indirect music learning should continue to be examined when considering effective techniques in music education. Research on the positive effects of direct music instruction on learning still offers the most convincing evidence for benefits (see, for example, Schellenberg, 2004, 2006; Southgate & Roscigno, 2009; Standley, 2008). As mentioned in Chapter I, many of the music teaching programs including Gordon and Kodály emphasize the need for active participation in music activities for optimal benefits. Nevertheless, the subject of the effects of background music on music learning remains a largely unexamined yet potentially promising area of study, and certainly a study on an educational program that combines the two learning techniques would be a striking contribution to the existing body of literature on the subject.

The current climate in music education is a source of frustration for many music educators in the United States. The widespread result of the No Child Left Behind Act (NCLB) of 2001 (Public Law 107-110), and more recently the new Common Core State Standards Initiative ("Common Core," 2012), is that both have purloined precious time from school subjects that are not held to the standards of state testing, such as art and music. As a result, music teachers are challenged to offer quality music experiences with compromised time and often on an inadequate budget.

The results of the current study offer a potential way to maximize improvements in music aptitude both easily and unobtrusively. Playing a well-chosen selection of background music during opportune times in a child's day is as clever as hiding

vegetables in cookies: it is inexpensive, enjoyable, and chock-full of benefits. Elementary music teachers would be well served to advocate for the use of background music in classrooms, during transitions throughout the school, and at any other suitable time during the school day in which children are not cognitively engaged. If children's music aptitude could improve with background music in the classroom, then their ability to engage in the material taught in a formal music class might be improved as well.

Additionally, classroom teachers might consider using the information presented in this study to their advantage, since appropriate background music can offer a more pleasant classroom environment while potentially improving music aptitude. Further, the results of the current study might be applicable beyond the classroom environment. For example, if parents are looking for an easy and inexpensive way to enhance their young child's music aptitude, they might consider playing background music at home during periods of relaxation, such as dinnertime and playtime. With so much research connecting success in music with success later in life (NAfME, 2007), playing an enjoyable CD at appropriate times during the day would seem to be an obvious choice.

If music education is to flourish in our schools, it behooves music advocates to find ways to manage the predicament of limited music instructional time. While there is no substitution for a quality music education such as direct instruction and guided music experiences, music educators in search of an idea that is easy, inexpensive, enjoyable, and most importantly does not require any valuable classroom music time, should consider looking to background music as a viable strategy to helping children develop musically, outside of the music classroom.

APPENDICES

A. BACKGROUND MUSIC SELECTIONS

Jump Right In to Listening: Music for Young Children
Excerpts Compiled by Edwin E. Gordon

1.	2:15	R. Strauss	Fanfare
2.	2:00	M. Ravel	Pavane pour une infante défunte
3.	2:15	J. Brahms	Symphony #1
4.	2:00	S. Prokofiev	Romeo and Juliet
5.	2:15	D. Shostakovich	Symphony #1
6.	1:55	G. Fauré	Pelléas et Mélisande Suite
7.	2:00	W.A. Mozart	Symphony #41
8.	1:00	Josquin des Pres	Music for Viola
9.	2:15	L. van Beethoven	Symphony #5
10.	3:05	C. Debussy	Prelude to the Afternoon of a Faun
11.	1:50	W. Byrd	Music for Broken Consort
12.	2:15	A. Hovhaness	Symphony #4
13.	1:45	A. Dvorak	Slavonic Dances
14.	2:15	D. Shostakovich	Festive Overture
15.	2:05	M. Praetorius	Courante, Ballet and Volta
16.	1:30	G. Fauré	Pelléas et Mélisande
17.	2:20	W. Schuman	Chester
18.	1:15	R. Wagner	Parsifal
19.	2:05	B. Kalinnikov	Symphony #1
20.	2:15	F. Mendelssohn	Symphony #3
21.	2:00	W.A. Mozart	The Magic Flute
22.	2:15	D. Shostakovich	Festive Overture
23.	2:10	G. Fauré	Pelléas et Mélisande
24.	1:10	B. Britten	Peter Grimes
25.	2:00	C. Mell	Il Cordino and Capriccio Chomatico
26.	2:00	J. Dowland	Lacrimae Antiquae
27.	1:55	F. Mendelssohn	Symphony #3
28.	2:20	G. Holst	Hammersmith
29.	2:15	G. Woolfenden	Illyrian Dances
30.	1:00	N. Dello-Joio	Variations, Chaconne, and Finale

Total: 59:45 minutes

APPENDICES

B. IRB PARENT/GUARDIAN INFORMED CONSENT FORM

Consent to Participate Form

Dear Parents of second-grade students,

I would like to invite your child to participate in a research study I am conducting at KT Murphy elementary school. Please be aware that both the administration and the second-grade classroom teachers at the school have approved this study. The purpose of this project is to learn if background listening affects children's music aptitude.

Music aptitude tests will be administered to all second-grade students participating in the experiment sometime in February. Then, over the course of sixteen weeks, two of the four second-grade classes will listen to background music in their classrooms for sixty minutes throughout the school day. At the end of the sixteen weeks, all students will be retested and comparisons between the classes will be made to determine any changes in music aptitude.

Background listening music was chosen from a variety of music determined by music educators to be beneficial in listening situations. Music will be played softly enough in class so as not to disturb those students who might be sensitive to it. Children's names will not be used on the tests, and all records will be kept private. Test answer sheets will be coded by the classroom teacher so that anonymity will be ensured, and all tests and test results will be locked in the KT Murphy Music cabinets located in the auditorium.

Participation is voluntary. If you have any questions regarding the nature of this research, please feel free to ask. Also, if you would like more information about your rights as the parent or guardian of research participants, you may contact David Berndt, the Coordinator of the Institutional Review Board for Human Subject Research of the Boston University Charles River Campus at 617-353-4365. If you do not wish for your child to participate in the music aptitude tests, and/or if your child prefers to decline participation, please indicate below and he/she will be excused from the test. You are encouraged to discuss this with your child. Please know that your decision will not affect your child's music education or grade.

If you have questions for me about this study, please feel free to call me. My home phone number is _____. You may also call me during school hours at _____.

Thank you for your consideration.

Sincerely.
Dorene Falcetta, Music Teacher

_____ _____

Student's name Classroom teacher's name

Parental consent: ☐ Yes, I wish my child to participate ☐ Child agrees to participate

☐ No, we decline participation

_____

Parent or guardian's signature

APPENDICES

C. IRB STUDENT ASSENT FORM

Assent to Participate Form

Dear Second-Grade Student,

I want to tell you about a research study I am doing. Research studies help us to learn new things and test new ideas. During research studies, the researchers collect a lot of information so that they can learn more about something. I am doing this study because I would like to learn more about how listening to background music in your classroom might help improve your music intelligence. I am asking you to join because I believe you might benefit from listening to the background music I chose for this project.

There are a few things you should know about this study:

- ☐ You get to decide if you want to be in the study
- ☐ You can say 'No' or 'Yes,' and whatever you decide is OK
- ☐ If you say 'Yes' now, you can change your mind and say 'No' later
- ☐ No one will be upset if you say 'No'
- ☐ You can ask questions at any time
- ☐ I will also get permission from your parent/guardian for you to take part in this study

If you decide to be in this study, I will ask you and your classmates to take a 20-minute music test with me in the auditorium. After you take the test, I will divide the 2nd graders into two groups. Half of you will hear the background music I chose and half of you will not. If you are in the group that gets to hear music in the classroom, your teacher will play music for you every morning and afternoon for 16 weeks. If you are not in the group that will hear background music, there will be no extra music playing in your classroom, and you can go about your day as usual. At the end of the 16 weeks, you'll all come back to the auditorium to take the music test again. I will compare the tests of all the 2nd-grade classes to learn if listening to music was beneficial. I will also ask you to fill out a survey. If you were in the group that listened to the music I chose, this will be your chance to tell me if you liked the music or not. You can say whatever you like.

I don't know if participating in this study will help you, but it's possible that listening to background music will be good for you! If you are in the group that gets to listen to the background music and you decide you don't like it, or if you think the music is too loud, your teacher will allow you to move your seat. You do not have to take part in this research study either. You can say 'Yes' or 'No'. You can say 'Yes' now and change your mind later. All you have to do is tell us you want to stop. No one will be mad if you don't want to take part in the study or if you change your mind about taking part in the study. Your parent or guardian can also decide to have you stop taking part in this study—that is OK too.

You won't need to study for this test, and it won't count toward your grade. I am not even going to put your name on your test, so no one will know how you did on the test—not even your parents!

If you have any questions about this study, you can talk with me at any time at school.

Sincerely,
Ms. Falcetta

Student's name _____ **Classroom teacher's name** _____

Student Assent: □ **Yes, I want to participate** □ **No, I don't want to participate**

APPENDICES

D. INSTRUCTIONS TO TEACHERS

1. This study will last for a period of fourteen weeks.

2. During the week prior to the beginning of the project, I will administer a music aptitude test in the school auditorium to every 2nd-grade student in the school participating in the project.

3. The teachers assigned to the Treatment Group (the group that will listen to the background music chosen for this project) will be asked to play two 30-minute CD's of music especially compiled for this study. The first CD should be played in the morning during arrival time, and the second CD should be played in the afternoon during dismissal time. If for some reason you will be unable to play a CD at the designated time, you are encouraged to find another non-academic session during the school day to play the CD. Both CD's should be played once per day. I will work with teachers to ensure that the CD players are placed in an effective location in the classroom, and that the volume levels are set at a consistent decibel that is audible without being a distraction. The teachers assigned to the Control Group (the group that will not listen to the background music chosen for this project) should conduct their classes in the usual manner.

4. Over the course of the fourteen-week project, I will visit the classrooms periodically to assist with and/or supervise the playing of background music.

5. At the end of the treatment period, I will retest the students in the school auditorium. At this time, I will also administer a brief survey asking the students group if they liked the music they heard.

6. If you need to contact me for any reason, please leave me a note in my mailbox or Email me on the school website. You can also call me at home if necessary at _____.

7. Thank you very much for participating in this project!

Dorene Falcetta

APPENDICES

E. PREFERENCE QUESTIONNAIRE

Class _____ ID # _____

Music Preference Questionnaire

You heard background music in your class for the last fourteen weeks in the morning when you arrived at school and at the end of the school day just before dismissal. Please indicate below if you liked the music you heard:

☐ **YES I liked the music** ☐ **NO I didn't like the music**

****

Class _____ ID # _____

Music Preference Questionnaire

You heard background music in your class for the last fourteen weeks in the morning when you arrived at school and at the end of the school day just before dismissal. Please indicate below if you liked the music you heard:

☐ **YES I liked the music** ☐ **NO I didn't like the music**

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CURRICULUM VITAE

Dorene Elizabeth Falcetta was born in [redacted], and was raised in [redacted]. She attended The Hartt School of Music of the University of Hartford in West Hartford, Connecticut, graduating in 1981 Magna Cum Laude with a Bachelor of Music in both Music Education and Voice Performance, and a minor in Kodály Education. She also studied briefly on scholarship at the University of Siena in Italy in 1980. With honors and scholarship in both academics and performance from Mu Phi Epsilon, Pi Kappa Lambda, the National Association of Teachers of Singing, and the Metropolitan Opera National Council Competition in Connecticut, she was awarded a full graduate assistantship to join the Hartt Opera Theater in 1981. She graduated the Hartt School of Music in 1984 with a Master of Music in Opera, at which time she took advantage of performance opportunities for fifteen years. Since returning to education, her continued graduate studies were pursued at Boston University's College of Fine Arts, where her research was conducted under the direction of Dr. Manny Brand. She has held teaching appointments throughout Connecticut and New York; she was also a Resident Artist and guest lecturer for the Connecticut Grand Opera company for many years. She currently teaches elementary school general and vocal/choral music in Stamford, Connecticut; she also teaches voice and piano in private practice in Connecticut and New York, and she serves as Music Coordinator and soloist with St. John's Episcopal Church choir in New York.

Dr. Falcetta can be contacted through the Stamford Board of Education:

[redacted]