Comparative Audiation Difficulty of tonal, Rhythm, and Melodic Patterns Among Grade 4 Students

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COMPARATIVE AUDIATION DIFFICULTY OF TONAL, RHYTHM, AND MELODIC PATTERNS AMONG GRADE 4 STUDENTS

by

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Bachelor of Music
Eastman School of Music, 2009

Submitted in Partial Fulfillment of the Requirements
For the Degree of Master of Music Education in
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Dedication

My thesis is dedicated to the countless individuals who have supported me throughout my journey as an undergraduate student at the Eastman School of Music and as a graduate student at the University of South Carolina. I wish to thank my family, friends, colleagues, and professors for their advice, friendship, and support. In addition, I wish to extend my appreciation to my undergraduate music education professors, Dr. Richard Grunow and Dr. Christopher Azzara, for challenging me to improve my musicianship and inspiring me to think critically about music education.

“When we merely recognize what we have heard or memorize what we intend to perform, we live in the past. In audiation, the past lives in us.” (Gordon, 1999, p. 18)
Acknowledgements

I wish to express my most sincere appreciation to my thesis advisor and mentor, Dr. Edwin Gordon, for his encouragement, guidance, inspiration, and wisdom. The opportunity to learn from Dr. Gordon has been an invaluable experience. Thank you, Dr. Gordon, for believing in my potential to pursue research and for helping me to complete this ambitious project.

I wish to thank Dr. Wendy Valerio, not only for being a thesis reader and my academic advisor for two years, but for encouraging me to pursue my graduate work at the University of South Carolina. Dr. Valerio initiated the establishment of my graduate assistantship in the Gordon Archive and connected me to music teaching opportunities at Fort Jackson Schools. In addition, I wish to thank Dr. Gail Barnes for her dedication as a thesis reader and for introducing me to the fundamentals of music education research in her graduate course. Although the design of my thesis was advised by Dr. Gordon, Dr. Valerio and Dr. Barnes advised me with respect to writing style and presentation. Thank you for helping me to improve my writing.

Alec Harris of GIA Publications was extremely kind to grant me permission to modify the audio component of Gordon’s *Primary Measures of Music Audiation* (PMMA), which I subsequently used as the basis of my *Melodic Pattern Audiation Test* (MPAT) in this study. GIA also generously donated PMMA answer sheets that I used as MPAT answer sheets in this study.
I wish to thank Richard Horah, my teaching colleague and friend, for helping me to score MPAT student answer sheets and for proofreading multiple versions of this document. In addition, I wish to thank Maggie Wirth for her support and assistance when I conducted research in the Gordon Archive.

This study was possible thanks to the willingness of three classroom teachers and 58 fourth-grade student participants at the elementary school in New York State.
Abstract

The purpose of this research was to investigate the audiation difficulty of melodic patterns. The specific research problems of this study were to: (a) examine the relationships between the audiation difficulty of melodic patterns compared to the audiation difficulty of their embedded tonal patterns and embedded rhythm patterns, (b) determine if tonal pattern difficulty and/or rhythm pattern difficulty may be used to predict melodic pattern difficulty, (c) examine the mean differences between the audiation difficulty of melodic patterns compared to the audiation difficulty of their embedded tonal patterns and embedded rhythm patterns, and (d) examine the mean differences between the audiation difficulty of 3:3, 4:4, and 5:5 proportioned melodic patterns.

Grade 4 students (N = 58) in Albany, New York were administered three versions of the researcher-developed *Melodic Pattern Audiation Test* (MPAT-A, MPAT-B, & MPAT-C) (Danahy, 2013). Using 6,790 item responses to conduct item analysis, Pearson product-moment correlations, and a one-way analysis of variance, the researcher determined that for this population: (a) the audiation difficulty of melodic patterns was weakly correlated to the audiation difficulty of their embedded tonal patterns ($r = -.28, p = .029$) and embedded rhythm patterns ($r = .36, p = .005$), (b) tonal pattern difficulty and/or rhythm pattern difficulty cannot be used to predict melodic pattern difficulty, (c) Grade 4 students were able to audiate proportioned melodic patterns more easily than
tonal patterns and rhythm patterns, and (d) the complexity of a proportioned melodic pattern, with respect to the number of pitches and rhythmic durations, may not affect audiation difficulty.
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Chapter 1

Introduction

Music educators strive to provide instructional contexts in which student-learning experiences progress from simplest to most complex in a developmentally appropriate sequence according to how students most efficiently develop skills and understandings. To that end, vocal and instrumental music educators facilitate instructional contexts for students to acquire extensive vocabularies of tonal patterns and rhythm patterns; the “building blocks of music” (Serafine, 1990, p. 52), as a means to develop aural skills, vocal and instrumental performance skills, and therefore, lay the foundation for the development of comprehensive musicianship. Although such an instructional endeavor may be a relatively minimal component of any music learning context with respect to time allocation, music educators (Azzara, 1993; Bluestine, 2000; Gordon, 2007; Grunow, 2005; Liperote, 2006) contend that sequential tonal pattern and rhythm pattern instruction is an essential component of music education contexts.

Using various research methodologies, the importance of tonal pattern and rhythm pattern instruction in music education has been directly and indirectly substantiated by music educators, music psychologists, and music theorists. Music education researchers contend that students’ music achievement may be enhanced by sequential and systematic tonal pattern instruction (Azzara, 1993; Gamble, 1989; Grutzmacher, 1985; Jones, 1994; MacKnight, 1975; Stringham, 2010; Velez, 2009) and rhythm pattern instruction (Azzara, 1993; Gouzouasis, 1990; Harding, 2010; Jones, 1994; Shehan, 1987; Stringham, 2010).
Music psychologists and theorists (Cuddy, 1982; Deutsch, 1999; Dowling & Harwood, 1986; Dowling, 1999; Fiske, 2005; Hodges, 2011; Sloboda, 1985; Temperley, 2004) contend that music perception and cognition occur with respect to patterns of tones and rhythmic durations, rather than isolated and syntactically decontextualized pitches and rhythmic durations. According to Elliott (1995), music listening experiences, which include music making experiences by extension, involve “scanning acoustic waves for musical information, constructing cohesive musical patterns from this information (e.g., melodic patterns, rhythmic patterns, dynamic patterns), interpreting this information, and making comparisons among musical patterns” (p. 83).

Historically eminent music educators such as Zoltán Kodály (1882 – 1967), Carl Orff (1895 – 1982), and Edwin Gordon¹ (b. 1927), developed philosophies and instructional approaches to emphasize the importance of teaching students to listen to, vocalize, and instrumentally perform tonal patterns and rhythm patterns (Chosky, 1998; Gordon, 1976; Houlanan & Tacka, 2008; Walters & Taggart, 1989). Instructional approaches based on Gordon’s music learning theory² equally emphasize importance of tonal patterns and rhythm patterns taught in isolation (Bluestine, 2000). Forty-five years ago, in his first publication, How Children Learn When They Learn Music (1967a), Gordon theorized that one’s basic acquisition of a vocabulary of tonal patterns and rhythm patterns, through a reciprocal process of aural perception (listening) and

¹ Gordon is a “music educational theorist” (Bluestine, 2000, p. xi) and is currently Research Professor in the Edwin E. Gordon Archive/Thomas Cooper Library at the University of South Carolina in Columbia. Refer to Learning Sequences in Music: A Contemporary Music Learning Theory (Gordon, 2012) for an in-depth explanation of Gordon’s theories of music learning, music aptitude, and audiation, among other topics related to music education. Refer to Gerhardstein (2001) and Gordon (2006) for biographical and autobiographical information, respectively.

² Gordon’s “music learning theory” often refers to a theoretical framework for music education, which includes theories of how students learn music, but also suggested teaching techniques, sequential curricular objectives, methods, and assessment procedures.
vocalization (singing tonal patterns and speaking or chanting rhythm patterns), would partially serve to establish the readiness for formal learning experiences with music notation:

In accordance with his basic musical aptitudes to develop tonal sense and rhythmic feeling, a person acquires a rote vocabulary of tonal and rhythm patterns. The development of a rote vocabulary of significant tonal and rhythm patterns constitutes the experience through which musical meaning is associated with music notation; just as a rote vocabulary of the spoken word constitutes the vehicle by which meaning is given to the written word. (Gordon, 1967, p. 4)

In Gordon’s 1971 and 1976 texts, the author cited Bean (1939), Broman (1956), DeYarman (1972), Dittemore (1970), MacKnight (1975), Mainwaring (1933), Miller (1975), Ortmann (1937), Petzold (1966), and Van Nuys & Weaver (1943) who substantiated the importance of students’ developing vocabularies of tonal patterns and rhythm patterns in association with learning to read music notation. In order to provide music educators with a developmentally appropriate sequence of teaching tonal patterns and rhythm patterns, Gordon examined how children aurally perceive and cognize tonal patterns and rhythm patterns3 in terms “sameness” and “difference” in three seminal studies (Gordon, 1974, 1976, 1978). As a result, Gordon constructed a tonal content learning sequence (a sequential hierarchy of tonal patterns) and a rhythm content learning sequence (a sequential hierarchy of rhythm patterns) to work in conjunction with his skill learning sequence. Gordon’s proposed sequences of tonal patterns and rhythm patterns are based on the respective difficulty levels of the patterns in terms of audiation.

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3 One’s ability to aurally perceive and cognize tonal patterns and rhythm patterns in terms “sameness” and “difference” may be measured by developmental music aptitude tests developed by Gordon (1978, 1982).
Gordon suggested that music educators initially teach students tonal patterns and rhythm patterns easiest to audiate, before progressing to tonal patterns and rhythm patterns that are more difficult to audiate. Gordon theorized that children’s audiation may be most efficiently enhanced through intensive, long-term, and diverse learning experiences with appropriate sequences of tonal patterns and rhythm patterns in a context of tonality and meter, respectively. Gordon theorized that tonal patterns and rhythm patterns, learned through repetition in the reciprocal aural/oral process in an established context of tonality or meter, respectively, may be retained in long-term memory. Contextual learning of patterns based on those “key perceptual organizers” (Ester, 2005, p. 20) may facilitate transfer from short-term memory to working memory, and encoding to and retrieval from long-term memory.

In the music learning theory-based instructional approaches, including Developing Musicianship through Improvisation (Azzara & Grunow, 2006, 2010a, 2010b), Jump Right In: The Early Childhood Music Curriculum: Music Play (Valerio, Reynolds, Bolton, Taggart, & Gordon, 1998), Jump Right In: The Instrumental Series (Grunow, Gordon, & Azzara, 2001), Jump Right In: The Music Curriculum (Taggart, Bolton, Reynolds, Valerio, & Gordon, 2000, 2001, 2004, 2006; Taggart, Reynolds, Valerio, Lange, Bailey, & Gordon 2010), and Music Moves for Piano (Lowe, 2004), the authors appear to differentiate between 1) tonal patterns; 2) rhythm patterns; and 3) melodic patterns. (See Figure 1.1).

Those authors, through their pedagogical approaches, define tonal patterns as groupings of two, three, four, or five tones (pitches) with each tone having equal duration. Tonal patterns, therefore, do not possess rhythmic variance. The authors define
rhythm patterns as groupings of two or more rhythmic durations without tonal variance. According to Gordon (2007), a melodic pattern is the simultaneous combination of a tonal pattern and a rhythm pattern. In other words, a melodic pattern contains an embedded tonal pattern and embedded rhythm pattern.

![Tonal, Rhythm, and Melodic Patterns](image)

Figure 1.1: Tonal, Rhythm, and Melodic Patterns. An example of a three-tone tonal pattern, rhythm pattern that contains eight durations, and a melodic pattern that contains eight durations and three pitches. The melodic pattern is based on the exact sequence of pitches found in the tonal pattern and the exact sequence of durations found in the rhythm pattern. That is, the tonal pattern and rhythm pattern are embedded in the melodic pattern. The melodic pattern contains consecutively repeated pitches and an unequal ratio of unique pitches (three) to rhythmic durations (eight). That is an example of a 3:8 disproportioned melodic pattern. (Refer to Figure 3.1 on page 23, and Figure 3.2 on page 25 for an explanation about proportioned and disproportioned melodic patterns.)

Music learning theory-based instructional approaches contain sequential activities designed to develop students’ vocabularies of tonal patterns and rhythm patterns in a variety of tonalities and meters, respectively. Within the context of music listening and music making experiences, as well as learning sequence activities, tonal patterns and rhythm patterns serve a multitude of functions as students listen to, perform composed music with and without notation, improvise, compose, and analyze music. The developmentally appropriate interaction between pattern instructional contexts and holistic music listening and making contexts, wherein students’ attention is constantly diverted to aurally comprehending the structural elements of music, constitutes the essence of Gordon’s theory of audiation development, which Gordon (2007) considers fundamental to both music aptitude and music achievement.
According to Gordon (2007), however, tonal pattern instruction and rhythm pattern instruction must occur independently. Nonetheless, music education theorists (e.g., Miklaszewski, 1986; Reimer, 1994) have questioned Gordon’s approach of teaching tonal patterns and rhythm patterns independently. During the 1994 MENC Conference, Reimer criticized Gordon for advocating the teaching of “non-rhythmic melodic fragments and non-melodic rhythmic fragments [that] take our students into the realm not of music, but of the music-oid [sic]. That is, resembling music in some mechanical way, but not being music” (Reimer & Gordon, 1994).

In fact, Gordon’s practice of separating tonal patterns and rhythm patterns in learning sequence activities is not a means to an end, but rather the starting point for developing skills to enhance “holistic melodic processing” (Holahan & Saunders, 2003, p. 231) or, to recommend a new term – *melodic audiation* – that occurs when listening to, performing, and creating musical structures. For this thesis, I propose that melodic audiation is the synthesis of tonal audiation and rhythm audiation.

The separation of tonal patterns and rhythm patterns, a key tenet of music learning theory, is directly supported by neuropsychological research with respect to melodic cognition. For example, researchers postulate that melodic cognition encompasses both tonal cognition and rhythm cognition, which may function independently (Boltz, 1991; Monahan & Carterette, 1985; Palmer & Krumhansl, 1987; Okada & Abe, 2004). According to Colwell and Richardson (2002), researchers suggest “pitch and rhythm

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4 In addition to Miklaszewski (1986) and Reimer (1994) who found specific issue with tonal patterns and rhythm patterns, other music educators (e.g., Colwell & Abrahams, 1991; Louth 2008; Shuler 1991a, 1991b; Stokes 1996) have questioned the validity of Gordon’s theories and the effectiveness of their practical applications.
interact at some levels of [melodic] processing but operate independently at other levels” (p. 478).

Through the use of functional magnetic resonance imaging (fMRI) and magnetoencephalography (MEG) technology, researchers (Overy, Norton, Cronin, Gaab, Alsop, Winner, & Schlaug, 2004) suggested that tonal processing occurs in the right auditory cortex while rhythm processing occurs in left auditory cortex in the brain. Although those researchers have “examined the extent to which pitch and rhythm interact in perception and memory” (Colwell, 2006, p. 478), their findings have been contradictory. For example, researchers such as Jones (1993) and Carterette, Monahan, Holman, Bell, and Fiske (1982) proposed that rhythmic structures may be more fundamental to melodic cognition than tonal structures. Hébert and Peretz (1997), on the other hand, proposed that tonal structures are more fundamental to melodic cognition than rhythmic structures. I am unaware of researchers who have considered the relationships between melodic patterns and their embedded tonal patterns and embedded rhythm patterns. Such a research investigation could provide another perspective into the nature of melodic cognition.

Independent instructional activities devoted to tonal audiation and rhythm audiation enrichment may seem logical to music educators. Subsequent instructional activities devoted to melodic audiation enrichment, as specifically related to tonal audiation and rhythm audiation, may also seem logical to music educators. In my own teaching, after students learn to audiate and improvise tonal patterns and rhythm patterns, I recommend students learn how to improvise melodic patterns in three contexts wherein I: (a) establish a familiar tonal context and invite students to improvise melodic patterns
so their attention is primarily devoted to tonality, (b) establish a familiar rhythmic context and invite students to improvise melodic patterns so their attention is primarily devoted to meter, and (c) simultaneously establish familiar tonal and rhythmic contexts and invite students to improvise series of melodic patterns so their attention is devoted to tonality and meter in the context of a familiar harmonic pattern.

Nonetheless, authors of current music learning theory-based instructional approaches have not recommended activities specifically designed to foster students’ melodic audiation development in relation to students’ tonal audiation and rhythm audiation skill development. Furthermore, music learning theorists do not provide information regarding how tonal audiation and rhythm audiation skills are synthesized in melodic contexts (Stokes, 1996) at perceptual, cognitive, or metacognitive levels. In his keynote address at the 3rd International Conference on Music Learning Theory, Gordon (2011) admitted that deficit:

Some music educators insist it is best not to separate tonal patterns and rhythm patterns in pedagogical practice. … Unfortunately, there is not sufficient research to resolve the controversy. Opinions largely prevail. Well-designed investigations would go a long way in shedding light on practitioners’ dilemma. … I have attempted for a number of years to design studies to reveal how we combine tonal patterns and rhythm patterns when we audiate melodic patterns. I never enjoyed success. No doubt a valid answer would impact incalculably on learning sequence activities. (pp. 3-4)

Although tonal pattern and rhythm pattern instructional contexts are well established, researchers and practitioners have not posited a sequence or method of
systematically teaching students to audiate melodic patterns. In fact, little is known about
the ability of students to audiate and perform individual melodic patterns and melodic
pattern series, with and without relation to the audiation and performance of individual
tonal patterns, tonal patterns series, individual rhythm patterns, and rhythm pattern series.
Perhaps music educators could develop learning sequences based on melodic patterns in
addition to and based upon acquired tonal patterns and rhythm patterns that are familiar
to students. Whether such an instructional endeavor would be feasible, or even
worthwhile, is currently unknown. Prior to designing melodic learning sequence activities
and developing a theory about melodic learning, however, music educators and
researchers should investigate the nature of melodic patterns with respect to their
audiation difficulty.

Purpose

With the intent of improving music educators’ understanding of students’
audiation processes, the purpose of this research is to investigate the audiation difficulty
of melodic patterns.

Problems

The specific research problems were to: (a) examine the relationships between the
audiation difficulty of melodic patterns compared to the audiation difficulty of their
embedded tonal patterns and embedded rhythm patterns, (b) determine if tonal pattern
difficulty and/or rhythm pattern difficulty may be used to predict melodic pattern
difficulty, (c) examine the mean differences between the audiation difficulty of melodic
patterns compared to the audiation difficulty of their embedded patterns and rhythm
patterns, and (d) examine the mean differences between the audiation difficulty of 3:3,
4:4, and 5:5 proportioned melodic patterns.
Definition of Terms

Audiation, a term coined by Gordon (1974), refers to the cognitive process of hearing and comprehending musical sounds in terms of tonal and rhythmic contexts. In this study, tonal audiation, rhythm audiation, and melodic audiation refer to discrete but interrelated forms of musical cognition; the aural perception and comprehension of musical sounds.

Learning sequence activities occur during the first ten minutes of a music learning context, such as a class, lesson, or rehearsal. Tonal pattern and rhythm pattern instruction activities include skill, tonal, rhythm, and pattern learning sequences (Gordon, 2007).

Melodic patterns are combined grouping of a tonal pattern and a rhythm pattern (Gordon, 2007). (See Figure 1.1). Proportioned melodic patterns contain an equal ratio of unique pitches and unique rhythmic durations. Disproportioned melodic patterns contain an unequal ratio of unique pitches and unique rhythmic durations. (See Figure 3.1 on page 23 and Figure 3.2 on page 25).

Music achievement refers to a student’s level of accomplishment in music that is demonstrated by performing pre-composed music with and without notation, composing, arranging, improvising, and conducting (Elliott, 1995; Gordon, 2007).

Music aptitude refers to a student’s level of potential to achieve in music (Gordon, 2007). Gordon has constructed a variety of psychometric instruments that measure

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5 Due to the lack of research on the topic of melodic patterns in relation to music learning theory and audiation, I developed several terms that are used throughout this study: melodic audiation, embedded tonal pattern, embedded rhythm pattern, proportioned melodic pattern, and disproportioned melodic pattern.

*Rhythm patterns* are groupings of two or more rhythmic durations that do not possess tonal variance (Gordon, 2007). (See Figure 1.1). A rhythm pattern found in a melodic pattern is referred to as an *embedded rhythm pattern*.

*Skill learning sequence* refers to the curriculum that includes all discrimination and inference skills taught sequentially to students in conjunction with tonal or rhythm learning sequences (Gordon, 2007).

*Tonal patterns* are groupings of two, three, four, or five tones (pitches) whereas each tone is perceived to have relatively equal rhythmic duration (Gordon, 1976). (See Figure 1.1). A tonal pattern found in a melodic pattern is referred to as an *embedded tonal pattern*. 
Chapter 2

Related Research

Toward the Development of a Taxonomy of Tonal Patterns and Rhythm Patterns:

Evidence of Difficulty Level and Growth Rate (Gordon, 1974)

In three separate research studies, Gordon (1974, 1976, 1978) examined how children audiate tonal patterns and rhythm patterns. According to Wolf (2004), Gordon’s taxonomic studies represent the “apogee of pattern research” (p. 16). Gordon completed the 1974 study to develop taxonomy of tonal patterns and rhythm patterns, and accessed the results of the 1971 national standardization program of the six levels of the *Iowa Tests of Music Literacy* (ITML) (Gordon, 1971). Students in Grades 4 through 12, representing 27 school systems in 13 of the United States, participated in the standardization program. With the ITML scores of 18,680 students available, Gordon randomly sampled 250 students in each of the norms groups and used the resultant sample of 2,750 students for the study.

First, Gordon calculated item difficulty and item discrimination coefficients for the test items in the ITML battery, which comprised six subtests: Tonal *Aural Perception*, *Reading Recognition*, and *Notational Understanding*; and Rhythmic *Aural Perception*, *Reading Recognition*, and *Notational Understanding*. Second, following in the system initiated in *The Psychology of Music Teaching* (Gordon, 1971) and the *ITML Manual* (Gordon, 1971), Gordon developed a “Musical Organization Taxonomy of Tonal and Rhythm Patterns.” According to the taxonomy, Gordon identified individual tones
(pitches) grouped in two’s, three’s, four’s, and five’s as tonal patterns. Most tonal patterns were identified as groupings of three tones, while some were identified as groupings of two tones. Rhythmic duration series consisting of two, three, four, five, and six notes, were identified as rhythm patterns. Tonal patterns in major and minor modes, and rhythm patterns in duple and triple meters were organized into divisions of basic and complex. According to Gordon (1976), the 1974 study served three functions by providing:

1) direction for developing a taxonomy of classifications and categories of tonal patterns and rhythm patterns for research purposes, 2) impetus to the development of a method for studying the aural perception of specific tonal patterns and rhythm patterns in a musical context while at the same time substantially minimizing the effects of confounding factors; and 3) probably of most importance, establishment of design and analysis procedures for investigating the difficulty level and growth rate of individual patterns. (p. 5)

**Tonal and Rhythm Patterns: An Objective Analysis (Gordon, 1976)**

In the 1976 study, *Tonal and Rhythm Patterns: An Objective Analysis*, Gordon expanded the initial taxonomy of tonal patterns and rhythm patterns described in the results of the 1971 study. Two research problems were identified: 1) develop extensive separate taxonomies of tonal patterns and rhythm patterns and 2) establish the aural perception difficulty level and growth rate of the individual patterns in the taxonomies (p. 6). A total of 1,395 patterns, including 862 tonal patterns and 533 rhythm patterns, were recorded with a Moog Sonic Six synthesizer, a rhythm programmer, and a Revox A77 tape recorder.
In order to determine the difficulty levels and growth rates of the patterns, the
tonal pattern and rhythm pattern recordings were administered to 10,121 students in
grades 4, 5, and 6 in forty-eight schools in the states of New York, Wisconsin, Illinois,
Michigan, and Florida. Tonal patterns were classified according to tonality: major, minor,
dorian, phrygian, lydian, mixolydian, aeolian, and intertonal. Rhythm patterns were
classified according to meter: usual duple, usual triple, usual combined, unusual duple,
unusual triple, unusual paired combined, unusual unpaired combined, and unusual
unpaired nonmetrical.

Students listened to a musical sequence, followed by the word, first. Then, the
pattern was performed, followed by the word, second and the second performance of the
pattern. A five-second period of silence was allowed following the first and second
hearing of the pattern, allowing the student time to make his or her response on the
answer sheet. Students filled in ovals to indicate whether the second pattern of the pair
was the same (S) or not the same (NS) as the first pattern of the pattern. If the student was
unable to judge, the student was directed to choose the “in-doubt response” by marking
the question mark option on the answer sheet.

The difficulty level of individual tonal patterns and rhythm patterns were
determined by item difficulty coefficients. Patterns audiated as being same by a large
percentage of students were classified as easy; patterns audiated as being same by
approximately half of the students were classified as moderate difficulty; and patterns
audiated as same by a few listeners were classified as difficult. Patterns were also
classified in terms of possessing high, typical, or static-regressive growth rates. Patterns
that became easier to audiate with age were classified as high; patterns that typical
sustained their difficulty level as students aged were classified as *typical*; and patterns that became increasingly difficult to audiate as the students aged were classified as *static-regressive*. Based on the item difficulty coefficients, Gordon found tonal patterns were easier to audiate than rhythm patterns, and rhythm patterns in usual duple meter patterns were easier to audiate than rhythm patterns in usual triple meter.

**A Factor Analytic Description of Tonal and Rhythm Patterns and Objective Evidence of Pattern Difficulty Level and Growth Rate (Gordon, 1978)**

In the 1978 study, four groups of students who attended Eric County (New York) public schools participated over an eight-month period, from September 1976 to April 1977. The four groups were comprised of 134 Grade 4 students, 139 Grade 4 students, 87 Grade 7 students, and 82 Grade 8 students, respectively. Students’ levels of music aptitude and achievement were measured by the *Musical Aptitude Profile* (MAP) (Gordon, 1965) and the *Iowa Tests of Music Literacy* (ITML) (Gordon, 1971), respectively. After Gordon determined students possessed normal levels of music aptitude and achievement, they listened to tape-recorded tonal patterns and rhythm patterns. Similar to the 1976 study, students were asked to determine whether the patterns were the *same* or *not the same*.

Gordon conducted a factor analysis of the 1,114 tonal patterns and 486 rhythm patterns. Based on the aforementioned research, Gordon identified the tonal patterns and rhythm patterns that were found to be *easy* to audiate and possess a *static* growth rate. Tonal patterns in major and minor tonalities, and rhythm patterns in all meters were paired and used as items in the *Primary Measures of Music Audiation* (PMMA) (Gordon, 1979); a test designed to measure the developmental tonal and rhythm aptitudes of
students in kindergarten through Grade 3. Since then, researchers (e.g., Bell, 1981; Danahy, 2012; Holahan, 1983; Holahan & Thomson, 1981; Jessup, 1984; Lee, 2011; Pettit, 1996; Stamou, 2010; Woodruff, 1983; Yap, 2003) have established psychometric properties and validity of PMMA, and used the test in various research contexts.

**Additional Research**

Based on Gordon’s taxonomic studies, music education researchers examined implications of tonal pattern and rhythm pattern difficulty levels in practical ways for music teaching and learning. For example, music education researchers examined performance difficulty levels of tonal patterns (Jones, 1979; Lai, 1999; Sinor, 1984; Wolf, 2005) and rhythm patterns (Bradford, 1995; Lai, 1999; Wolf, 2004). A smaller number of researchers have attempted to confirm and extend Gordon’s theories through additional psychoacoustic research.

Holahan and Saunders studied the audiation of tonal patterns (Holahan & Saunders, 1997; Holahan, Saunders, & Goldberg, 2000; Saunders & Holahan, 1993). Those researchers differentiated between *cognitive structures* and *functional cognitive mechanisms* of tonal audiation. Structures could refer to contour of a tonal pattern, or number of pitches it contains, for example, and mechanisms could refer to response time required for one to make an accurate or inaccurate “same” or “different” judgment in response to a pair of tonal patterns.

Although Holahan, Saunders, and Goldberg did not examine interactions between tonal, rhythm, and melodic audiation, their studies have “furthered the discussion” (Stringham, 2010, p. 13) with respect to pattern audiation. In fact, prior to the present study, Holahan, Saunders, and Goldberg were the only researchers to examine pattern
cognition through the lens of Gordon’s audiation theory. In the present study I will provide the first attempt to examine the relationship between audiation difficulty of melodic patterns, and perhaps the first attempt to examine the nature of melodic patterns in relation to Gordon’s audiation theory.
Chapter 3

Design and Analysis

Melodic Pattern Audiation Test (MPAT) Development

To investigate the audiation difficulty of melodic patterns in relation to the audiation difficulty of their embedded tonal patterns and embedded rhythm patterns, I conceptualized a measure of melodic audiation and developed three versions of MPAT. Comparable to PMMA (Gordon, 1979) and IMMA (Gordon, 1982), the MPAT is a paper-and-pencil, recorded music listening assessment that requires the listener to engage in aural-musical discrimination tasks. Comparable to either the Tonal or Rhythm subtest of PMMA or IMMA, the required administration time for MPAT is approximately 25 minutes. (See Appendix A).

As is the case Gordon’s measures of music aptitude, with the exception of the Advanced Measures of Music Audiation\(^6\) (AMMA) (Gordon, 1989), specialized music training is not a requirement to successfully complete MPAT. Students with specialized music training may or may not score higher than students without specialized music training. With respect to students’ prior knowledge, however, students must possess a conceptual understanding of the simple terms *same* and *different* and their applicability to discriminating between musical sound patterns.

Unlike the Tonal and Rhythm subtests of PMMA, each of which comprise 40 pairs of *same* or *different* tonal patterns and 40 pairs of *same* or *different* rhythm patterns,\(^6\) One should understand the concepts of *tonal difference* and *rhythmic difference* when differentiating between pairs of melodic phrases used in AMMA (Gordon, 1989).
respectively, MPAT comprises 20 pairs of *same* melodic patterns and 20 pairs of *different* melodic patterns. To successfully complete MPAT, students are required to listen to pairs of melodic patterns and indicate whether the two melodic patterns that constitute each pair sound the *same* or *different*. I created three versions of MPAT (MPAT-1, MPAT-2, and MPAT-3), which will be described hereafter.

**Development of MPAT-1.** In my first attempt to create MPAT, which resulted in the development of MPAT-1, I decided to construct the melodic pattern items using the tonal pattern items and the rhythm pattern items found in PMMA. First, I arranged the 40 tonal pattern items into two categories; *tonal-same* and *tonal-different*, and the 40 rhythm pattern items into an additional two categories; *rhythm-same* and *rhythm-different*. Second, I used Microsoft® Excel 2010 to randomize the order of items in each category and then randomly pair the 20 *same* tonal pattern items (T2, T4, T5, T8, T10, T11, T14, T16, T17, T20, T22, T23, T25, T27, T28, T31, T33, T34, T37, T40) with the 20 *same* rhythm pattern items (R1, R4, R6, R7, R10, R12, R15, R16, R18, R20, R23, R24, R26, R28, R31, R33, R34, R36, R37, R40) to create 20 *same* melodic pattern items. Third, I randomly paired the 20 *different* tonal pattern items (T1, T3, T6, T7, T9, T12, T13, T15, T18, T19, T21, T24, T26, T29, T30, T32, T35, T36, T38, T39) and the 20 *different* rhythm pattern items (R2, R3, R5, R8, R9, R11, R13, R14, R17, R19, R21, R22, R25, R27, R29, R30, R32, R35, R38, R39) to create 20 *different* melodic pattern items. Once the theoretical construction of the 20 *same* melodic pattern items and 20 *different* melodic pattern items had been accomplished, I notated the melodic pattern items by hand. Three *same* melodic pattern items and one *different* melodic pattern item could only be theorized but not realized because the tonal patterns and rhythm patterns were not
compatible to form a melodic pattern items. Thus, MPAT-1 contained 36 items; 17 same items and 19 different items, rather than an even split of 20 same and 20 different items.

I became concerned about the potential validity of MPAT-1 due to that uneven split and because all 20 different melodic pattern items simultaneously contained both tonal and rhythmic differences, therefore enabling listeners to very easily recognize different items. Because of that, listeners may have been simultaneously enabled to easily and perhaps artificially recognize (rather than audiate) the 20 same melodic pattern items as such. In that case, practically all of the different melodic pattern items would have likely yielded extremely high item difficulty coefficients, and most of the same melodic pattern items would have likely yielded moderately high or extremely high item difficulty coefficients. Therefore, I discarded MPAT-1 because its design may have produced psychometrically unsound results. That is, a severely skewed (asymmetrical) distribution of melodic pattern item difficulty coefficients. More specifically, same melodic pattern item difficulty coefficients, which determine individual melodic pattern difficulty levels, could have been artificially high and therefore invalid.

Development of MPAT-2. In my second attempt to develop MPAT, which resulted in the development of MPAT-2, I intuitively selected 20 tonal patterns and 20 rhythm patterns based on tonality and meter classification, respectively, function classification, and audiation difficulty level from the taxonomy of 862 tonal patterns and 533 rhythm patterns established by Gordon (1976). I sought to generate a stratified random selection of 20 tonal patterns, and a separate stratified random selection of 20 rhythm patterns. I intuitively selected three-tone tonal patterns in major and harmonic minor tonalities, and rhythm patterns in duple, triple, combined, unusual paired, and
unusual unpaired meters. As a result, tonal patterns in dorian, mixolydian, phrygian, lydian, and locrian tonalities, and rhythm patterns in unusual paired intact and unusual unpaired intact meters were not included.

With respect to tonal patterns, I intuitively selected 10 tonal patterns in major tonality (C keyality) and 10 patterns in harmonic minor tonality (transposed to C keyality from A keyality) of varying audiation difficulty levels. In the context of major tonality, I selected two tonic, two dominant, two subdominant, one modulatory, one cadential, one multiple, and one expanded pattern. In the context of harmonic minor tonality, I selected two tonic, two dominant, two subdominant, one modulatory, one cadential, one multiple, and one expanded pattern. I ensured that approximately 15% of the 20 tonal patterns were classified as easy to audiate, 15% were classified as difficult to audiate, and the remaining 70% were classified as moderately difficult to audiate, according to Gordon’s (1976) classifications. I selected that distribution of item difficulties as I attempted to “balance the range of item difficulty of [MPAT-2] to approximate the shape of the standard normal curve” (Walters, 2010, p. 155).

With respect to rhythm patterns of varying audiation difficulty levels, I intuitively selected five patterns in duple meter, seven patterns in triple meter, four patterns in combined meter, two patterns in unusual paired meter, and two patterns in unusual unpaired meter. With respect to function classification, I intuitively selected two patterns containing macrobeats and microbeats, nine patterns containing divisions and elongations, and nine patterns containing upbeats. I was challenged to select patterns that not only represented a variety of audiation difficulty levels, but also contained rhythmic durations as to be compatible with three-tone tonal patterns to form melodic patterns.
Based on the aforementioned rationale provided by Walters (2010), I ensured that approximately 15% of the 20 rhythm patterns were classified as easy to audiate; 15% were classified as difficult to audiate; and the remaining 70% were classified as moderately difficult to audiate, according to Gordon’s (1976) classifications.

To develop melodic pattern items used in MPAT-2, I undertook two processes. First, I rank-ordered the 20 tonal patterns and 20 rhythm patterns from most difficult-to-audiate to easiest-to-audiate. Second, I paired those tonal patterns and rhythm patterns according to similar audiation difficulty levels. For example, with respect to audiation difficulty, I paired the most difficult tonal pattern with the most difficult rhythm pattern. Accordingly, for example, I paired the easiest tonal pattern with the easiest rhythm pattern.

When I designed melodic pattern items in MPAT-2, I unwarily combined three-tone tonal patterns with rhythm patterns that contained three, four, five, six, and seven durations. As a result, I realized that some melodic patterns comprised combinations of three-tone tonal patterns with rhythm patterns that contained three durations. Those melodic patterns, therefore, contained the same number of temporal intonations as their embedded tonal patterns and embedded rhythm patterns.

The majority of melodic patterns used in MPAT-2, however, contained combinations of three-tonal tonal patterns with four, five, six, and seven durations. In those cases, melodic patterns contained the same number of temporal intonations as their embedded rhythm pattern, but not their embedded tonal patterns. Those melodic patterns also contained at least one occurrence of consecutively repeated pitches.
I realized that I inadvertently constructed two types of melodic patterns and subsequently developed the terms *proportioned melodic pattern* and *disproportioned melodic pattern*. Whereas proportioned melodic patterns contain the same number of unique pitches and rhythmic durations, disproportioned melodic patterns do not contain the same number of unique pitches and rhythmic durations. In other words, proportioned melodic patterns contain an equal ratio of unique pitches and rhythmic durations; disproportioned melodic patterns contain an unequal ratio of unique pitches and rhythmic durations. (See Figure 3.1).

![3:3 Proportioned Melodic Pattern](image)

![3:5 Disproportioned Melodic Pattern](image)

**Figure 3.1: Proportioned and Disproportioned Melodic Patterns.** An example of a 3:3 proportioned melodic pattern which contains three non-repeated pitches and three rhythmic durations. In contrast, the 3:5 disproportioned melodic pattern contains three pitches but five rhythmic durations.

I am unaware of researchers who have previously identified or examined the differences between proportioned and disproportioned melodic patterns. Therefore, I decided to examine only proportioned melodic patterns in this study, rather than attempt to simultaneously examine both proportioned and disproportioned melodic patterns. That would have been an enormous undertaking far beyond the scope of master’s thesis; therefore, I abandoned the MPAT-2 model.

**Development of MPAT-3: MPAT-A, MPAT-B, and MPAT-C.** In my third attempt to develop a model for a melodic pattern audiation test, I created three similarly structured assessments: MPAT-A, MPAT-B, and MPAT-C. For those versions I used only proportioned melodic patterns in the *same* items and disproportioned melodic patterns in the *different* items. First, I intuitively selected 40 tonal patterns from the
Gordon’s (1976) taxonomy; 20 tonal patterns in major tonality, and 20 tonal patterns in harmonic minor tonality. I intuitively selected 10 three-tone tonal patterns in major tonality, 10 four-tone tonal patterns in major tonality, 10 three-tone tonal patterns in harmonic minor tonality, and 10 four-tone tonal patterns in harmonic minor tonality.

Second, I selected 40 rhythm patterns in duple and triple meters also from the taxonomy (Gordon, 1976). I specifically selected 20 rhythm patterns each contained three rhythmic durations, and 20 rhythm patterns each contained four rhythm durations. I combined three-tone tonal patterns with rhythm patterns that contained three durations to produce twenty 3:3 proportioned melodic patterns. Likewise, I arbitrarily selected and combined four-tone tonal patterns with rhythm patterns that contained four durations to produce twenty 4:4 proportioned melodic patterns.

Third, I intuitively decided that MPAT-A should only include ten 3:3 and ten 4:4 proportioned melodic patterns in major tonality: 20 same items. I randomly composed 20 different melodic pattern items in major tonality to serve as distractor items. In contrast, I decided that MPAT-B should only include ten 3:3 and ten 4:4 proportioned melodic patterns in harmonic minor tonality: 20 same items. Similar to MPAT-A, I randomly composed 20 different melodic pattern items in harmonic minor tonality to serve as distractor items for MPAT-B. Therefore, MPAT-A included 40 items; 20 same items (3:3 and 4:4 proportioned melodic patterns) and 20 different items in major tonality. MPAT-B also included 40 items; 20 same items (3:3 and 4:4 proportioned melodic patterns) and 20 different items in harmonic minor tonality. (See Appendices C, D, and E for embedded tonal patterns used in MPAT, embedded rhythm patterns used in MPAT, and melodic patterns used in MPAT).
I then combined 20 five-tone tonal patterns with 20 rhythm patterns that contained five durations to produce twenty 5:5 proportioned melodic patterns. Those 20 melodic patterns, representing a variety of tonalities and meters became the 20 same items in MPAT-C. I haphazardly composed 20 different melodic pattern items in various tonalities and meters to serve as distractor items. Different from MPAT-A and MPAT-B, MPAT-C contains 40 items: 20 same items (5:5 proportioned melodic patterns) and 20 different items in various tonalities and meters. (See Figure 3.2).

![Proportioned Melodic Patterns](image)

**Figure 3.2: Proportioned Melodic Patterns.** An example of a 3:3 proportioned melodic pattern, 4:4 proportioned melodic pattern, and 5:5 proportioned melodic pattern. In each melodic pattern, there is an equal ratio of unique pitches and rhythmic durations.

**Development of the audio component of MPAT-3.** After I finalized the theoretical construction of the 120 melodic pattern items (a total of 240 individual melodic patterns) for MPAT-A, MPAT-B, and MPAT-C tests. I entered the notation into a computer using Sibelius® notation creation software (Version 7), and rendered the notation as a MIDI (Music Instrument Digital Interface) file. I imported the MIDI file into Anvil Studio™ (Version 2012.01.06), a MIDI editing application, and applied Panzertank PM4, a VSTi (Virtual Studio Technology Instrument) synthesizer, to render the MIDI file as a digital audio file. I selected and configured that particular VSTi in order to replicate the sounds of a 1970’s Moog Sonic Six, the duophonic analog synthesizer that Gordon used to create the recorded audio component of the *Primary Measures of Music Audiation* (PMMA) (Gordon, 1979). My decision was based on Gordon’s rationalization that:
young children are more attentive when they hear an electronic instrument than when they hear an actual musical instrument played or one typically used by children, such as a bell-type instrument. In preliminary research with PMMA, the reliability of both subtests increased significantly when a synthesizer was used in place of a standard musical instrument (1998a, p. 121).

Based on the rationale explained by Gordon (1986), I chose the PMMA-Tonal answer document to function as the answer document for MPAT. Using Audacity® (Version 1.3.13-beta), a digital audio editing and recording application, I isolated the digital audio file containing the 40 PMMA-Tonal items from the compact disc recording of PMMA⁷, and replaced the 40 tonal pattern items with the 40 melodic pattern items to create each assessment. Therefore, the item-identifying words (such as boat, tree, and pencil) and the option identifying words, first and second, remained intact in the resultant MPAT digital audio files.

**Institutional Review Board Approval.**

During the spring of 2013, I prepared and submitted a study application for review by the University of South Carolina’s Institutional Review Board (IRB). My submission included an (a) informed consent invitation letter for parents, (b) informed consent agreement for parents, and (c) assent form for Grade 4 students (See Appendix F). The University’s IRB indicated that this study was exempted from IRB approval due to its nature.

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⁷ In March 2012, I obtained permission from Mr. Alec Harris of GIA Publications to modify the Primary Measures of Music Audiation (PMMA) audio recording for this study. Mr. Harris also provided permission to use the PMMA answer document for this study and generously supplied student answer documents to use in MPAT administration.
Participants

Participants in this study ($N = 58$) were Grade 4 students from three intact classrooms at a public elementary school in New York State. Given the diversity of that particular school, student participants represented a variety of ethnic backgrounds and socioeconomic statuses.

With the assistance of the public elementary school’s music teacher, each respective classroom teacher administered the three versions of the *Melodic Pattern Audiation Test* (MPAT-A, MPAT-B, and MPAT-C). Students were familiar with the terms *same* and *different* as applicable to music discrimination tasks required to complete MPAT because the music teacher at the school reported using the terms *same* and *different* to engage students in music discrimination tasks as a normal part of classroom music instruction. Additionally, students were familiar with those terms because they were administered the *Intermediate Measures of Music Audiation* (IMMA) (Gordon, 1982) earlier in the school year. That assessment, IMMA, uses the terms *same* and *different* to engage students in music discrimination tasks. The MPAT assessments were administered on separate, non-consecutive days during usual music instruction time.

Analysis

After obtaining the completed student answer documents from the teacher participants, I hand-scored MPAT-A student answer documents ($n = 57$), MPAT-B ($n = 54$) student answer documents, and MPAT-C student answer documents ($n = 58$). Using IBM SPSS Statistics 20, I entered all item data for the 40 items on 169 student answer documents; 6,760 item responses in SPSS. Then I conducted a standard item analysis using the data for the 120 melodic pattern items used within MPAT-A, MPAT-B, and MPAT-C. I disregarded the item difficulty coefficients of the 60 *different* melodic pattern
items, while isolating the item difficulty coefficients for the 60 same melodic pattern items. That is because the item difficulty coefficients of same melodic pattern items are used to determine the audiation difficulty level of the patterns.

Relationships between (a) tonal pattern difficulty and melodic pattern difficulty, and (b) rhythm pattern difficulty and melodic pattern difficulty were determined by Pearson product-moment correlation coefficients. Means and standard deviations were calculated for tonal pattern, rhythm pattern, and melodic pattern difficulty, and subjected to a one-way analysis of variance (ANOVA). Means and standard deviations were also calculated for 3:3, 4:4, and 5:5 proportioned melodic patterns, and subjected to a one-way ANOVA.
Chapter 4

Results and Discussion

The specific problems in this study were to: (a) examine the relationships between the audiation difficulty of melodic patterns compared to the audiation difficulty of their embedded tonal patterns and embedded rhythm patterns, (b) determine if tonal pattern difficulty and/or rhythm pattern difficulty may be used to predict melodic pattern difficulty, (c) examine the mean differences between the audiation difficulty of melodic patterns compared to the audiation difficulty of their embedded tonal patterns and embedded rhythm patterns, and (d) examine the mean differences between the audiation difficulty of 3:3, 4:4, and 5:5 proportioned melodic patterns.

Tonal, Rhythm, and Melodic Pattern Relationships

First, I examined the relationship between the 60 same melodic patterns as found in MPAT-A, MPAT-B, and MPAT-C and their embedded tonal patterns with respect to item difficulty coefficients. (See Appendix B). The Pearson product-moment correlation coefficient was \( r = -.28, n = 60, p = .029 \). Therefore, the relationship between melodic pattern difficulty and tonal pattern difficulty was low, negative, and statistically significant \( p < .05 \).

Second, I examined the relationship between the 60 same melodic pattern items as found in MPAT-A, MPAT-B, and MPAT-C and their embedded rhythm patterns with

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8 Refer to Figure 3.1 on page 23, and Figure 3.2 on page 25 for an explanation regarding (a) the differences between proportioned and disproportioned melodic patterns, and (b) the differences among 3:3, 4:4, and 5:5 proportioned melodic patterns.
respect to item difficulty coefficients. (See Appendix B). The Pearson product-moment correlation coefficient was \( r = .36, n = 60, p = .005 \); therefore, the relationship between melodic pattern difficulty and rhythm pattern difficulty was low, positive, and statistically significant \( (p < .05) \).

Although I found the correlations between melodic pattern difficulty and tonal pattern difficulty \( (r = -.28) \) and melodic pattern difficulty and embedded rhythm pattern difficulty \( (r = .36) \) to be statistically significant \( (p < .05) \), both correlations were weak. Furthermore, scatterplots generated in SPSS provided a visual confirmation of the weak linear relationships among the variables. As a result, I did not conduct a linear regression analysis because embedded tonal pattern difficulty and/or embedded rhythm pattern difficulty could not have been used to accurately predict melodic pattern difficulty.

Additionally, I calculated the coefficient of determination \( (r^2) \) for each correlation. I found eight percent (8%) shared variance between the difficulty of melodic patterns and embedded tonal patterns, and thirteen percent (13%) shared variance between the difficulty of melodic patterns and rhythm patterns. Although there was a weak statistical relationship in each case, I interpreted no practical relationship between the variables.

**Audiation Difficulty of Tonal, Rhythm, and Melodic Patterns**

To examine the mean differences between the audiation difficulty of melodic patterns compared to the audiation difficulty of their embedded tonal patterns and embedded rhythm patterns I initially examined the mean differences among the audiation difficulty of 60 *same* melodic patterns items \( (M = .81, [CI_{95} = .79, .84], SD = .11) \) determined in this study, and the audiation difficulty of 60 embedded tonal patterns \( (M = \)
.73, [CI\textsubscript{95} = .70, .75], SD = .08) and 60 embedded rhythm patterns (M = .55, [CI\textsubscript{95} = .53, .58], SD = .11) determined by Gordon (1976). (See Table 4.1).

Table 4.1
Difficulty Coefficients of Tonal, Rhythm, and Melodic Patterns

<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tonal Patterns</td>
<td>.54</td>
<td>.89</td>
<td>.73</td>
<td>.08</td>
</tr>
<tr>
<td>Rhythm Patterns</td>
<td>.20</td>
<td>.83</td>
<td>.55</td>
<td>.11</td>
</tr>
<tr>
<td>Melodic Patterns</td>
<td>.60</td>
<td>.98</td>
<td>.81</td>
<td>.11</td>
</tr>
</tbody>
</table>

I analyzed data for equal variances among the three groups (melodic pattern difficulty, tonal pattern difficulty, and rhythm pattern difficulty) using Levene’s test for equality of error variances \(F(2, 177) = 2.31, p = .102\). Because the p-value was greater than .05 indicated and equal variances among the groups, I calculated a one-way analysis of variance (ANOVA). Using the one-way ANOVA I found a statistically significant difference with respect to the mean item difficulty coefficients among melodic, tonal, and rhythm patterns \(F(2, 177) = 103.49, p < .001\). (See Table 4.2). Given the limited assortment of only 60 patterns, melodic patterns were found to be easier to audiate than their embedded tonal patterns and embedded rhythm patterns. Based on the results of a Tukey HSD post-hoc comparison test, I confirmed statistically significant differences \(p < .001\) among the three pattern types (tonal, rhythm, melodic) with respect to audiation difficulty.
Table 4.2

One-Way Analysis of Variance for Effect of Pattern Type on Difficulty Coefficients

<table>
<thead>
<tr>
<th></th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contrast</td>
<td>2.092</td>
<td>2</td>
<td>1.046</td>
<td>103.489</td>
<td>* .000</td>
</tr>
<tr>
<td>Error</td>
<td>1.789</td>
<td>177</td>
<td>.010</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>3.882</td>
<td>179</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p = .000

Audiation Difficulty of Proportioned Melodic Patterns

I examined the mean differences between the audiation difficulty of 3:3 (M = .80, [CI_{95} = .76, .85], SD = .23), 4:4 (M = .81, [CI_{95} = .77, .86], SD = .21), and 5:5 proportioned melodic patterns (M = .83, [CI_{95} = .79, .88], SD = .23). (See Table 4.3). My hypothesis was that 3:3 proportioned melodic patterns would be easiest to audiate (compared to 4:4 and 5:5 portioned melodic patterns), whereas 4:4 proportioned melodic patterns would be more difficult to audiate, and 5:5 proportioned melodic patterns would be most difficult to audiate. In other words, I theorized that Grade 4 students could more easily audiate a melodic pattern containing fewer pitches and rhythmic durations than a melodic pattern containing more pitches and rhythmic durations. Interpreting the data from non-statistical perspective, however, 5:5 portioned melodic patterns appeared to be easiest, rather than most difficult, for students to audiate.
Table 4.3
Difficulty Coefficients of 3:3, 4:4, and 5:5 Proportioned Melodic Patterns

<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:3 Melodic Patterns</td>
<td>.63</td>
<td>.98</td>
<td>.80</td>
<td>.23</td>
</tr>
<tr>
<td>4:4 Melodic Patterns</td>
<td>.63</td>
<td>.96</td>
<td>.81</td>
<td>.21</td>
</tr>
<tr>
<td>5:5 Melodic Patterns</td>
<td>.60</td>
<td>.98</td>
<td>.83</td>
<td>.23</td>
</tr>
</tbody>
</table>

I analyzed data for equal variances among the three groups of proportioned melodic patterns using Levene’s test for equality of error variances \([F(2, 57) = .653, p = .524]\). Because the p-value was greater than .05 and indicated equal variances among the groups, I calculated a one-way analysis of variance (ANOVA). I found no statistically significant differences among the mean item difficulty coefficients among melodic patterns \([F(2, 57) = .475, p = .624]\). (See Table 4.4.) Based on the results of this study, the number of pitches and rhythmic durations in a melodic pattern did not affect the audiation difficulty level of each melodic pattern.

Table 4.4
One-Way Analysis of Variance for Effect of Melodic Pattern Complexity on Difficulty Coefficients

<table>
<thead>
<tr>
<th></th>
<th>SS</th>
<th>Df</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contrast</td>
<td>.010</td>
<td>2</td>
<td>.005</td>
<td>.475</td>
<td>*  .624</td>
</tr>
<tr>
<td>Error</td>
<td>.590</td>
<td>57</td>
<td>.010</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>.600</td>
<td>59</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*\(p > .05\)
Chapter 5
Summary and Conclusions

Purpose and Problems

With the intent of improving music educators’ understanding of students’ audiation processes, the purpose of this research was to investigate the audiation difficulty of melodic patterns. The specific problems of this study were to: (a) examine the relationships between the audiation difficulty of melodic patterns compared to the audiation difficulty of their embedded tonal patterns and embedded rhythm patterns, (b) determine if tonal pattern difficulty and/or rhythm pattern difficulty may be used to predict melodic pattern difficulty, (c) examine the mean differences between the audiation difficulty of melodic patterns compared to the audiation difficulty of their embedded tonal patterns and embedded rhythm patterns, and (d) examine the mean differences between the audiation difficulty of 3:3, 4:4, and 5:5 proportioned melodic patterns.

Design

Grade 4 students ($N = 58$) in a public elementary school in New York State participated in this study. Three intact fourth-grade classes were administered three versions of the Melodic Pattern Audiation Test (MPAT-A, MPAT-B, and MPAT-C), which I developed over a one-year period (2012-2013) prior to administration at the school. MPAT-A includes 3:3 and 4:4 proportioned melodic patterns in major tonality,
duple and triple meters. MPAT-B includes 3:3 and 4:4 proportioned melodic patterns in minor tonality, duple and triple meters. MPAT-C includes 5:5 proportioned melodic patterns in various tonalities and meters.

The MPAT assessments were administered by three classroom teachers in conjunction with the music teacher at the school. Students were familiar with the terms *same* and *different* as applicable to musical discrimination tasks required to complete MPAT. That is because the music teacher at the school reported using the terms *same* and *different* to engage students in musical discrimination tasks as a normal part of classroom music instruction. Additionally, students were fluent with those terms because they were administered IMMA (Gordon, 1982) earlier in the school year. Therefore, the MPAT student answer document was familiar to students.

Within the group of 58 fourth-grade students who participated in the study, 57 students were administered MPAT-A, 54 students were administered MPAT-B, and all 58 students were administered MPAT-C. To avoid test fatigue among the students, which could have negatively affected test reliability and consequently validity, the assessments were administered on separate, non-consecutive days during normal instructional time.

**Analysis**

Relationships between (a) tonal pattern difficulty and melodic pattern difficulty, and (b) rhythm pattern difficulty and melodic pattern difficulty were determined by Pearson product-moment correlation coefficients. Means and standard deviations were calculated for tonal pattern, rhythm pattern, and melodic pattern difficulty, and subjected to a one-way analysis of variance (ANOVA). Means and standard deviations were also
calculated for 3:3, 4:4, and 5:5 proportioned melodic patterns, and subjected to a one-way ANOVA.

**Results and Discussion**

I calculated Pearson product-moment correlation coefficients between melodic pattern difficulty coefficients and tonal pattern difficulty coefficients \((r = -.28, r^2 = .08)\) and between melodic pattern difficulty coefficients and rhythm pattern difficulty coefficients \((r = .36, r^2 = .13)\). Both relationships were statistically significant \((p < .05)\) however the correlations were weak. I did not conduct a linear regression analysis because tonal pattern difficulty and/or rhythm pattern difficulty could not have been used to accurately predict melodic pattern difficulty in this study.

I examined the mean differences among the audiation difficulty of 60 melodic patterns \((M = .81, [CI_{95} = .79, .84], SD = .11)\) determined in this study, and the audiation difficulty of 60 embedded tonal patterns \((M = .73, [CI_{95} = .70, .75], SD = .08)\) and 60 embedded rhythm patterns \((M = .55, [CI_{95} = .53, .58], SD = .11)\) determined by Gordon (1976). I calculated an analysis of variance (ANOVA) and found a statistically significant difference among the mean item difficulty coefficients among melodic, tonal, and rhythm patterns \([F(2, 177) = 103.49, p < .001]\). In this study, melodic patterns were easier for students to audiate than tonal patterns and rhythm patterns. Based on the results of a Tukey HSD post-hoc comparison test, I confirmed statistically significant differences \((p < .001)\) among the three pattern types with respect to audiation difficulty.

I examined the mean differences between the audiation difficulty of 3:3 \((M = .80, [CI_{95} = .76, .85], SD = .23)\), 4:4 \((M = .81, [CI_{95} = .77, .86], SD = .21)\), and 5:5 proportioned melodic patterns \((M = .83, [CI_{95} = .79, .88], SD = .23)\). I calculated an
analysis of variance (ANOVA) and found no statistically significant differences among the mean item difficulty coefficients for melodic patterns \[ F(2, 57) = .475, p = .624 \]. Based on the results of this study, the complexity of a proportioned melodic pattern, with respect to the number of pitches and rhythmic durations, did not affect the audiation difficulty level of the pattern.

**Conclusions and Implications for Music Education**

Based on the results obtained in this study, I concluded that the audiation difficulty of melodic patterns cannot be predicted by examining the audiation difficulty of their embedded tonal patterns or embedded rhythm patterns. That is, a melodic pattern as a composite whole may be more or less difficult to audiate than its embedded tonal and embedded rhythmic components. With respect to instructional contexts, music educators should not attempt to arrange or sequence melodic patterns based on the audition difficulty of their embedded tonal patterns and embedded rhythm patterns.

Because proportioned melodic patterns were easier for Grade 4 students to audiate than were embedded tonal patterns and embedded rhythm patterns, music educators may reconsider Gordon’s music learning theory as prescribed for students in the stabilized music aptitude phase (age nine and older). Compared to isolated tonal patterns and rhythm patterns, melodic patterns may be more sequentially appropriate for Grade 4 students and presumably other students in the stabilized music aptitude phase. During learning sequence activities and other audiation skill development exercises, those students may learn melodic patterns more easily than tonal patterns and rhythm patterns.

This study involved a relatively small sample of participants \( N = 58 \) from one elementary school in one geographic location. Furthermore, I used a relatively small
sample of only 60 melodic patterns and their embedded tonal patterns and embedded rhythm patterns to construct the three versions of MPAT. Results may have limited generalizability and should be interpreted with caution. Despite the findings in this study, the question posed by Gordon (personal communication, June 25, 2013): “Is it most prudent to teach melodic patterns, tonal patterns, or rhythm patterns?” cannot be answered conclusively based on the results of this study.

**Recommendations for Future Research**

Future researchers should replicate this study using a larger sample of participants, and a larger collection of melodic patterns. I also recommend that researchers conduct longitudinal studies involving multivariate statistical analyses to examine the difficulty levels and growth rates of proportioned melodic patterns in relation to their embedded components. Future researchers should confirm that Grade 4 students are able to more easily audiate melodic patterns than tonal patterns and rhythm patterns.

Researchers should administer the MPAT assessments to students in grades K-3 to investigate whether younger children in the developmental music aptitude phase also find melodic patterns easier to audiate than tonal patterns and rhythm patterns. If younger children are able to engage in melodic audiation more easily than tonal audiation and rhythm audiation, researchers could begin to challenge Gordon’s theories of music learning, music aptitude, and audiation based on objective research findings rather than subjective philosophical arguments.

Music education practitioners and researchers should collaborate to investigate how melodic pattern learning is related to (and unrelated to) tonal pattern and rhythm
pattern learning. Important questions for music educators and researchers to consider are: (a) could music educators systematically teach students to audiate melodic patterns in relation to students’ previously learned tonal patterns and rhythm patterns, and (b) how could music educators systematically engage students in developing melodic audiation skills in relation to their tonal audiation and rhythm audiation skill development?

Researchers could also study proportioned and disproportioned melodic patterns, as unrelated to tonal patterns and rhythm patterns and examine which characteristics (intervallic content, pitch sequence, tonal function, and rhythmic function) are contributing factors to the difficulty level of a melodic pattern. Researchers could adopt the research methodology used by Holahan and Saunders (1997), Holahan, Saunders, & Goldberg (2000), and Saunders & Holahan (1993) to examine how the complexity of a proportioned melodic pattern, with respect to cognitive structures and functional cognitive mechanisms, affect audiation difficulty.

Subsequently, researchers should investigate the use of MPAT as a possible tool for measuring the music aptitude and music achievement of Grade 4 students. Researchers should examine the reliability of the three MPAT versions and examine the relationships between those assessments and IMMA (Gordon, 1982) and MAP (Gordon, 1965).

I designed a total of 120 test items (60 same items and 60 different items) to be used among the three versions of MPAT. Researchers could conduct an item analysis and isolate the same and different items that possess high discrimination coefficients in order to develop a test of melodic audiation for experimental research purposes. That assessment could be administered and compared to the aforementioned aptitude tests.
(IMMA and MAP) to determine if and how melodic pattern audiation is related to tonal aptitude and rhythm aptitude. Furthermore, researchers could examine the hypothesized factorial structure (two-factor model) of that measure, through confirmatory factor analysis, to determine whether melodic audiation functions similarly to tonal and rhythm audiation with respect to separate psychological constructs of “sameness” and “difference.”

This study was the first to examine relationships between the audiation difficulty of melodic patterns and their embedded tonal patterns and embedded rhythm patterns. Researchers and music educators should collaborate to investigate the many unanswered questions that remain, especially with regard to Gordon’s audiation theory.
References


Anvil Studio (2012.01.06) [Computer software]. Shoreline, WA: Willow Software.


Figure A.1: PMMA Student Answer Document (Front Side)
Figure A.2: PMMA Student Answer Document (Back Side)
Appendix B

Tonal, Rhythm, and Melodic Pattern Difficulty

Table B.1: Audiation Difficulty of *Same* Melodic Pattern Items, Embedded Tonal Patterns, and Embedded Rhythm Patterns used in MPAT

<table>
<thead>
<tr>
<th>MPAT Item Number</th>
<th>Embedded-Tonal-Pattern Difficulty</th>
<th>Embedded-Rhythm-Pattern Difficulty</th>
<th>Melodic-Pattern Difficulty</th>
<th>P/R Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPAT-A/2</td>
<td>.73</td>
<td>.66</td>
<td>.98</td>
<td>3:3</td>
</tr>
<tr>
<td>MPAT-A/4</td>
<td>.69</td>
<td>.78</td>
<td>.89</td>
<td>3:3</td>
</tr>
<tr>
<td>MPAT-A/5</td>
<td>.85</td>
<td>.54</td>
<td>.74</td>
<td>3:3</td>
</tr>
<tr>
<td>MPAT-A/7</td>
<td>.59</td>
<td>.62</td>
<td>.86</td>
<td>3:3</td>
</tr>
<tr>
<td>MPAT-A/10</td>
<td>.82</td>
<td>.48</td>
<td>.84</td>
<td>3:3</td>
</tr>
<tr>
<td>MPAT-A/11</td>
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<td>.46</td>
<td>.93</td>
<td>3:3</td>
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<td>.77</td>
<td>.75</td>
<td>3:3</td>
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<td>.74</td>
<td>3:3</td>
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<td>.73</td>
<td>.96</td>
<td>3:3</td>
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<td>MPAT-A/22</td>
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<td>.48</td>
<td>.89</td>
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</tr>
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<td>.41</td>
<td>.77</td>
<td>4:4</td>
</tr>
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<td>MPAT-A/26</td>
<td>.74</td>
<td>.60</td>
<td>.91</td>
<td>4:4</td>
</tr>
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<td>MPAT-A/28</td>
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<td>.72</td>
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<td>MPAT-A/30</td>
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<td>.77</td>
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<td>MPAT-A/36</td>
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<td>.56</td>
<td>.77</td>
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<td>.55</td>
<td>.76</td>
<td>4:4</td>
</tr>
<tr>
<td>MPAT-B/7</td>
<td>.54</td>
<td>.49</td>
<td>.91</td>
<td>4:4</td>
</tr>
<tr>
<td>MPAT-B/9</td>
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<td>.76</td>
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</tr>
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<td>MPAT-B/11</td>
<td>.70</td>
<td>.67</td>
<td>.81</td>
<td>4:4</td>
</tr>
</tbody>
</table>

9 This column represents ratio of the number of pitches to rhythmic durations in the proportioned melodic pattern.
| MPAT-B/13 | .77 | .68 | .96 | 4:4 |
| MPAT-B/16 | .80 | .48 | .83 | 4:4 |
| MPAT-B/17 | .84 | .51 | .80 | 4:4 |
| MPAT-B/19 | .78 | .20 | .83 | 4:4 |
| MPAT-B/22 | .67 | .66 | .93 | 3:3 |
| MPAT-B/25 | .58 | .59 | .74 | 3:3 |
| MPAT-B/26 | .80 | .52 | .67 | 3:3 |
| MPAT-B/28 | .89 | .50 | .78 | 3:3 |
| MPAT-B/31 | .68 | .44 | .87 | 3:3 |
| MPAT-B/32 | .84 | .53 | .74 | 3:3 |
| MPAT-B/34 | .82 | .61 | .74 | 3:3 |
| MPAT-B/36 | .81 | .51 | .67 | 3:3 |
| MPAT-B/37 | .79 | .47 | .70 | 3:3 |
| MPAT-B/40 | .70 | .54 | .63 | 3:3 |
| MPAT-C/1  | .60 | .83 | .98 | 5:5 |
| MPAT-C/4  | .73 | .69 | .91 | 5:5 |
| MPAT-C/6  | .58 | .68 | .93 | 5:5 |
| MPAT-C/7  | .74 | .41 | .72 | 5:5 |
| MPAT-C/10 | .69 | .58 | .91 | 5:5 |
| MPAT-C/12 | .62 | .45 | .84 | 5:5 |
| MPAT-C/15 | .74 | .52 | .84 | 5:5 |
| MPAT-C/16 | .79 | .48 | .78 | 5:5 |
| MPAT-C/18 | .69 | .33 | .91 | 5:5 |
| MPAT-C/20 | .77 | .44 | .67 | 5:5 |
| MPAT-C/23 | .73 | .47 | .76 | 5:5 |
| MPAT-C/24 | .72 | .64 | .74 | 5:5 |
| MPAT-C/26 | .73 | .48 | .60 | 5:5 |
| MPAT-C/28 | .66 | .62 | .93 | 5:5 |
| MPAT-C/31 | .68 | .61 | .97 | 5:5 |
| MPAT-C/33 | .64 | .58 | .79 | 5:5 |
| MPAT-C/34 | .88 | .60 | .74 | 5:5 |
| MPAT-C/36 | .87 | .46 | .93 | 5:5 |
| MPAT-C/37 | .82 | .61 | .76 | 5:5 |
| MPAT-C/40 | .69 | .63 | .88 | 5:5 |
## Appendix C

### Tonal Patterns

Table C.1: Embedded Tonal Patterns used in MPAT

<table>
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<tr>
<th>Item Number</th>
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<th>Function</th>
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<td>Major</td>
<td>Dominant</td>
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<td>Tonic</td>
<td>.69</td>
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<td></td>
<td>Major</td>
<td>Modulatory</td>
<td>.85</td>
</tr>
<tr>
<td>MPAT-A/7</td>
<td></td>
<td>Major</td>
<td>Multiple</td>
<td>.59</td>
</tr>
<tr>
<td>MPAT-A/10</td>
<td></td>
<td>Major</td>
<td>Expanded</td>
<td>.82</td>
</tr>
<tr>
<td>MPAT-A/11</td>
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<td>Major</td>
<td>Subdominant</td>
<td>.79</td>
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<tr>
<td>MPAT-A/13</td>
<td></td>
<td>Major</td>
<td>Expanded</td>
<td>.69</td>
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MPAT-A/15  Major  Dominant  .78
MPAT-A/16  Major  Tonic  .80
MPAT-A/19  Major  Cadential  .63
MPAT-A/20  Major  Dominant  .69
MPAT-A/22  Major  Cadential  .71
MPAT-A/23  Major  Multiple  .72
MPAT-A/26  Major  Multiple  .74
MPAT-A/28  Major  Cadential  .66
MPAT-A/30  Major  Dominant  .81
MPAT-A/32  Major  Dominant  .71
MPAT-A/35

MPAT-A/36

MPAT-A/38

MPAT-B/1

MPAT-B/3

MPAT-B/4

MPAT-B/7

MPAT-B/9

MPAT-B/11

MPAT-B/13

Major Dominant

Major Dominant

Major Dominant

Minor Dominant

Minor Dominant

Minor Multiple

Minor Dominant

Minor Cadential

Minor Dominant

Minor Cadential
MPAT-B/16

Minor Cadential .80

MPAT-B/17

Minor Multiple .84

MPAT-B/19

Minor Multiple .78

MPAT-B/22

Minor Tonic .67

MPAT-B/25

Minor Dominant .58

MPAT-B/26

Minor Subdominant .80

MPAT-B/28

Minor Multiple .89

MPAT-B/31

Minor Tonic .68

MPAT-B/32

Minor Dominant .84

MPAT-B/34

Minor Expanded .82
MPAT-C/16

MPAT-C/18

MPAT-C/20

MPAT-C/23

MPAT-C/24

MPAT-C/26

MPAT-C/28

MPAT-C/31

MPAT-C/33

MPAT-C/34

Minor

Minor

Minor

Minor

Minor

Dorian

Dorian

Dorian

Dorian

Phrygian

Multiple

Multiple

Multiple

Multiple

Multiple

Characteristic

Characteristic

Characteristic

Characteristic

Characteristic

.79

.69

.77

.73

.72

.73

.66

.68

.64

.88
MPAT-C/36 Phrygian Characteristic .87
MPAT-C/37 Phrygian Characteristic .82
MPAT-C/40 Phrygian Characteristic .69
## Appendix D

### Rhythm Patterns

Table D.1: Embedded Rhythm Patterns used in MPAT

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Rhythm Pattern</th>
<th>Meter</th>
<th>Function</th>
<th>Difficulty Coefficient</th>
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<tbody>
<tr>
<td>MPAT-A/2</td>
<td>( \frac{2}{4} )</td>
<td>Duple</td>
<td>Division/ Elongation</td>
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<tr>
<td>MPAT-A/4</td>
<td>( \frac{2}{4} )</td>
<td>Duple</td>
<td>Division/ Elongation</td>
<td>.78</td>
</tr>
<tr>
<td>MPAT-A/5</td>
<td>( \frac{5}{8} )</td>
<td>Unusual Paired</td>
<td>Upbeats</td>
<td>.54</td>
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<tr>
<td>MPAT-A/7</td>
<td>( \frac{2}{4} )</td>
<td>Duple</td>
<td>Division/ Elongation</td>
<td>.62</td>
</tr>
<tr>
<td>MPAT-A/10</td>
<td>( \frac{6}{8} )</td>
<td>Triple</td>
<td>Upbeats</td>
<td>.48</td>
</tr>
<tr>
<td>MPAT-A/11</td>
<td>( \frac{6}{8} )</td>
<td>Triple</td>
<td>Division/ Elongation</td>
<td>.46</td>
</tr>
<tr>
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<td>.77</td>
</tr>
<tr>
<td>MPAT-A/15</td>
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<td>Upbeats</td>
<td>.70</td>
</tr>
<tr>
<td>MPAT-A/16</td>
<td>( \frac{2}{4} )</td>
<td>Duple</td>
<td>Division/ Elongation</td>
<td>.73</td>
</tr>
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</table>
MPAT-A/19

Unusual Division/ .52
Unpaired Elongation

MPAT-A/20

Duple Upbeats .65

MPAT-A/22

Triple Division/ .48
Elongation

MPAT-A/23

Unusual Division/ .41
Paired Elongation

MPAT-A/26

Duple Division/ .60
Elongation

MPAT-A/28

Triple Division/ .44
Elongation

MPAT-A/30

Triple Macrobeat/ .36
Microbeat

MPAT-A/32

Triple Upbeats .62

MPAT-A/35

Unusual Division/ .57
Paired Elongation

MPAT-A/36

Unusual Macrobeat/ .55
Unpaired Microbeat

MPAT-A/38

Unusual Unpaired Upbeats .56

MPAT-B/1

Duple Division/ .67
Elongation
MPAT-B/3
\[ \frac{3}{4} \] Combined Division/Elongation .54

MPAT-B/4
\[ \frac{5}{8} \] Unusual Paired Upbeats .55

MPAT-B/7
\[ \frac{7}{8} \] Unusual Unpaired Division/Elongation .49

MPAT-B/9
\[ \frac{6}{8} \] Triple Upbeats .49

MPAT-B/11
\[ \frac{2}{4} \] Duple Division/Elongation .67

MPAT-B/13
\[ \frac{2}{4} \] Duple Division/Elongation .68

MPAT-B/16
\[ \frac{6}{8} \] Triple Division/Elongation .48

MPAT-B/17
\[ \frac{3}{4} \] Combined Division/Elongation .51

MPAT-B/19
\[ \frac{7}{8} \] Unusual Unpaired Macrobeat/Microbeat .20

MPAT-B/22
\[ \frac{2}{4} \] Duple Upbeats .66

MPAT-B/25
\[ \frac{6}{8} \] Triple Division/Elongation .59

MPAT-B/26
\[ \frac{6}{8} \] Triple Upbeats .52
MPAT-B/28
Unusual Paired Division/Elongation .50

MPAT-B/31
Unusual Paired Division/Elongation .44

MPAT-B/32
Unusual Paired Division/Elongation .53

MPAT-B/34
Unusual Paired Division/Elongation .61

MPAT-B/36
Unusual Paired Upbeats .51

MPAT-B/37
Unusual Unpaired Division/Elongation .47

MPAT-B/40
Unusual Unpaired Division/Elongation .54

MPAT-C/1
Duple Division/Elongation .83

MPAT-C/4
Duple Division/Elongation .69

MPAT-C/6
Duple Upbeats .68

MPAT-C/7
Triple Division/Elongation .41

MPAT-C/10
Triple Division/Elongation .58

MPAT-C/12
Triple Division/Elongation .45
| MPAT-C/15 | 6/8 | Triple Division/Elongation | .52 |
| MPAT-C/16 | 6/8 | Triple Division/Elongation | .48 |
| MPAT-C/18 | 6/8 | Triple Division/Elongation | .33 |
| MPAT-C/20 | 6/8 | Triple Upbeats | .44 |
| MPAT-C/23 | 6/8 | Triple Upbeats | .47 |
| MPAT-C/24 | 2/4 | Combined Division/Elongation | .64 |
| MPAT-C/26 | 2/4 | Combined Division/Elongation | .48 |
| MPAT-C/28 | 2/4 | Combined Division/Elongation | .62 |
| MPAT-C/31 | 5/8 | Unusual Paired Division/Elongation | .61 |
| MPAT-C/33 | 5/8 | Unusual Paired Division/Elongation | .58 |
| MPAT-C/34 | 5/8 | Unusual Paired Division/Elongation | .60 |
| MPAT-C/36 | 5/8 | Unusual Paired Division/Elongation | .46 |
| MPAT-C/37 | \(\frac{5}{8}\) | Unusual Paired Division/Elongation | .61 |
| MPAT-C/40 | \(\frac{5}{8}\) | Unusual Paired Division/Elongation | .63 |
Appendix E

Melodic Patterns

Table E.1: Melodic Patterns used in MPAT

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Melodic Pattern</th>
<th>Difficulty Coefficient</th>
<th>P/R Ratio</th>
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<td>.89</td>
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<td><img src="image3" alt="Melodic Pattern" /></td>
<td>.74</td>
<td>3:3</td>
</tr>
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<td>.86</td>
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<td><img src="image5" alt="Melodic Pattern" /></td>
<td>.84</td>
<td>3:3</td>
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<tr>
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<td>.75</td>
<td>3:3</td>
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<tr>
<td>MPAT-B/16</td>
<td>.83</td>
<td>4:4</td>
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<td>.80</td>
<td>4:4</td>
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MPAT-C/37  \[\text{\includegraphics[width=2cm]{mpat-c37}}\]  .76  5:5

MPAT-C/40  \[\text{\includegraphics[width=2cm]{mpat-c40}}\]  .88  5:5
Appendix F

Informed Consent Invitation Letter for Parents

Informed Consent Agreement for Parents

Assent Form for Grade 4 Students
Dear Parent:

My name is Alan Danahy. As a graduate student in music education at the University of South Carolina, I am currently conducting a research study – *Comparative Audiation Difficulty of Tonal, Rhythm, and Melodic Patterns Among Grade 4 Students* – to fulfill my master’s degree thesis requirement. The purpose of the research study is to examine how Grade 4 students perceive and give meaning to musical sound patterns. By examining how students audiate tonal, rhythm, and melodic patterns, music educators and researchers may engender a greater understanding of how children develop music listening and performance skills in a developmentally appropriate sequence. My thesis is advised by Dr. Edwin Gordon of the University of South Carolina. Dr. Gail Barnes is the faculty sponsor for this study through the University’s Institutional Review Board (IRB).

Grade 4 students will be administered three versions of a music listening assessment called the *Melodic Pattern Audiation Test* (MPAT) in early February 2013. After your child completes the three different assessments (MPAT-A, MPAT-B, MPAT-C), his/her answer document will be transmitted to me for subsequent scoring and data analysis. Your child’s name or other identifiable information will not appear on the answer document. In addition, I will have no direct or indirect contact with your child. The music listening assessments will be administered by classroom teachers.

Your participation child’s participation in this study is completely voluntary. You may choose not to participate all, and you may discontinue participation at any time during the study, without negative consequences. If you choose to allow your child to participate in this research study by completing three music listening assessments, please read and sign the attached informed consent form.

Should you have any questions about this research, please contact Alan Danahy by email: danahya@email.sc.edu. The University of South Carolina is eager to ensure that all research participants are treated in a fair and respectful manner. If you have any concerns or questions about this study, please contact Mr. Thomas Coggins, University of South Carolina Office of Research, by phone; (803) 777-4456, or by email; tcoggins@gwm.sc.edu.

Sincerely,

Mr. Alan Danahy, Researcher
(803) 414-6355
danahya@email.sc.edu

Dr. Edwin Gordon, Research Advisor
(803) 777-1425
eegordon@mailbox.sc.edu
SCHOOL OF MUSIC

Informed Consent Agreement for Parents

Please return the attached form to child’s classroom teacher by February 1, 2013.

_________ Yes; I agree to allow my child to participate in the research study, *Comparative Audiation Difficulty of Tonal, Rhythm, and Melodic Patterns Among Grade 4 students*. I have read, understand, and agree to comply with the information outlined in the accompanying letter of informed consent. I understand that my child will be administered three music listening assessments and that his/her answer document (containing no identifiable information) will be transmitted to the researcher, Mr. Alan Danahy of the University of South Carolina, by February 15, 2013 for analysis.

_________ No; I do not agree for my child to participate in the research study.

________________________________________________________________________

Today's Date                                    Parent/Legal Guardian Printed Name

________________________________________________________________________

Home Telephone

Signature of Parent/Legal Guardian

Work Telephone

________________________________________________________________________

P.O. Box                                    Street

________________________________________________________________________

City                     State                     Zip Code

________________________________________________________________________

Student Name/Age                                    Classroom Teacher
SCHOOL OF MUSIC

Assent Form for Grade 4 Students

January 15, 2013

Dear Student:

My name is Alan Danahy. I am a researcher from the University of South Carolina. I am working on a study about musical sound patterns, and I would like your help. I am interested in learning more about how Grade 4 students listen and understand musical sound patterns. Your parent/guardian has already said it is “okay” for you to be in the study, but it is up to you. If you want to be in the study, you will be asked to do the following:

- Take three music listening tests. Each test will take about 25 minutes each and will be administered on three different days.

Your test answer sheet will be given to me by your teacher. No one except me will know your grades on the tests. Your classroom teacher and parents will not know your grades.

You do not have to help with this study. Being in the study is not related to your regular class work and will not help or hurt your grades. You can also drop out of the study at any time, for any reason, and you will not be in any trouble and no one will be mad at you.

Please ask any questions you would like to. Signing your name below means that you have read the information about the study, that any questions you had were answered, and that you have decided to be included in the study. You may drop out of the study at any time.

Student Name: ________________________________ Date: ______________

Classroom Teacher: ____________________________