

A comparison of the middle C and the mixed intervallic reading approaches on music reading among
beginner piano students

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Abstract

For many piano teachers, developing proficient reading skills in their young beginner students is one of the important aspects of weekly lessons yet it can also be one of the most frustrating tasks to undertake. To assist in this process, teachers look to method books to provide structure and an approach to music reading. Two reading approaches are prevalent in the current marketplace and widely used by teachers; the mixed intervallic approach and the middle C approach. The mixed intervallic approach, which stresses reading by interval, pattern and direction, is favoured and endorsed by current pedagogy and is adopted by many method books. This study compared the reading skills of young beginner piano students (ages 7-11) using either the mixed intervallic approach or the middle C approach to see which approach produced more reliable reading skills. Participants performed several music reading tasks to test keyboard identification (verbal), note identification in treble and bass clef (verbal), single note identification in C and G position (playing), broken and solid intervals in C and G position (playing), 3 note patterns and non-patterns in C and G position (playing), and sight reading. I hypothesized that the middle C students would perform better at single note identification while the mixed intervallic students would perform better in interval recognition, pattern recognition and sight reading. The results showed that the middle C students outperformed the mixed intervallic students in all tests except for keyboard identification and 3 note patterns in G position. These findings are surprising as they may indicate that the middle C approach, which is often criticized, is generating reliable reading skills among beginner piano students.

***Keywords:* music, piano, beginner piano students, mixed intervallic approach, middle C approach, method books**

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Introduction

It can be argued that the most important, yet challenging task of the piano teacher is teaching music reading to young beginner students. Music reading instruction is complex as it involves many elements such as visual note identification on the score, note location on the piano, and pattern recognition to name a few. The most common and perhaps indispensable tool for piano teachers is the beginner method book which often provides direction and strategies to assist teachers in this process. Not surprisingly there are numerous beginner method books available, however a problem arises; each method utilizes and endorses various music reading approaches such as the middle C, multi-key, intervallic and the current eclectic approach which uses the above approaches in combination. How does the teacher decide which method will generate reliable reading skills for their students? These reading approaches, of which some have been promoted for over sixty years, are widely used despite the fact that there is no overwhelming scientific evidence to support them and no evidence to show if one approach is creating more reliable reading skills over another. There is a significant need for research in this area and more specifically, research involving the reading skills of young beginner students who would benefit greatly from the results. This paper will examine two reading approaches; the middle C approach, one of the earliest music reading approaches, and the mixed intervallic approach, the teaching method favoured by current pedagogues. The introduction will provide descriptions of the middle C and intervallic reading approaches, and the advantages and disadvantages of each approach as presented in piano pedagogy textbooks.

The Middle C Approach

The middle C approach to reading has its roots in the early twentieth century with method books such as Blake's *Melody Book*, 1916 and Diller-Quaile *First Solo Book*, 1925 (Uszler, Gordon and Mach, 1995). These methods began with the presentation of simple melodies divided between the hands and

based on middle C reading (Uszler et al., 1995). The middle C approach was made popular by John Thompson’s method *Teaching Little Fingers to Play* in 1936 (Bastien, 1995). This reading approach begins with students placing both thumbs on middle C and are exposed to notation and rhythm simultaneously from the first piece (Bastien, 1995). Students learn subsequent notes one at a time and visually memorize their placement on the staff (Jacobson, 2015). Middle C methods often include graphics linking notes and pitch names on the staff with the keys on the piano (Uszler et al., 1995). Finger numbers are generously supplied, and the keys of the pieces are limited to C, G and F major (Bastien, 1995).

Advantages and Disadvantages of the Middle C Approach

There is little commentary or discussion available on the advantages and disadvantages of the middle C approach in piano pedagogy textbooks. Of the sources reviewed, the disadvantages outweigh the advantages as this approach in recent years has been viewed as an outdated approach to note reading. Uszler et al., (1995) provide a comprehensive list of advantages and disadvantages:

Table 1

Advantages and Disadvantages of the Middle C Approach

ADVANTAGES	DISADVANTAGES
Middle C on staff and piano, is an easy, because visually obvious, guide.	One guide note is unduly limiting. It is equally easy to establish association with two or more.
Fixing and confirming a limited amount of pitch names and piano key locations is easy.	Limitation of pitch and key recognition to those around middle C forces students to play with hands close to the body at the beginning of study.
Developing a sense of the key of C (before moving into other keys) fosters ear/hand security.	Variety of sound stimulates the student’s ear and imagination more than the recognition of just one key color.
In the beginning, it is helpful to associate certain fingers with certain keys and pitch names.	Students read from finger numbers rather than from knowledge of pitch names or directional sense.
Playing from thumb to outside of hand is required in keyboard literature. Moreover, this kind of technical beginning in one hand reinforces the same development in the other (mirror playing).	The thumb is an awkward finger at the keyboard. The fingers move more easily from the weak side of the hand to the strong.
Students learn best by absorbing small increments of information. Adding one pitch at a time is a logical, time-tested teaching technique.	Add-on learning delays transfer of knowledge based on recognition of patterns and groupings.

Note. Adapted from “The Well-Tempered Keyboard Teacher,” by M. Uszler, S. Gordon and S. M. Smith, p. 5. Copyright 1995 by Schirmer Books. Jacobson (2015) lists several disadvantages of the middle C approach which includes the use of

mnemonic devices and note reading which is dependent upon individual note recognition rather than on patterns and groupings of notes. Furthermore, eye and hand coordination can be difficult since note by note reading delays recognition of patterns and groups. She also remarks that keyboard topography is not emphasized with limited exposure to the full range of the keyboard and there is minimal reinforcement of previously learned concepts. Agay (1981) comments that middle C should only be used as a focal point in reading, a way to orient the reader to landmark notes on the staff. In general, the middle C approach is not favoured by most current pedagogy textbooks and many do not include or comment on the approach in their sections on music reading (Camp, 1992; Klingenstein, 2009; Fisher, 2010; Chronister, 2005; Clark, 1992; Bastien, 1995).

The Intervallic Approach

The intervallic approach (reading musical notation by direction or intervallic distances) grew out of the landmark reading approach which was first introduced in 1955 by Frances Clark (Bastien, 1995). The landmark reading approach begins with a considerable amount of off-staff notation and extensive experiences reading from partial staff notation (Uszler et al., 1995).

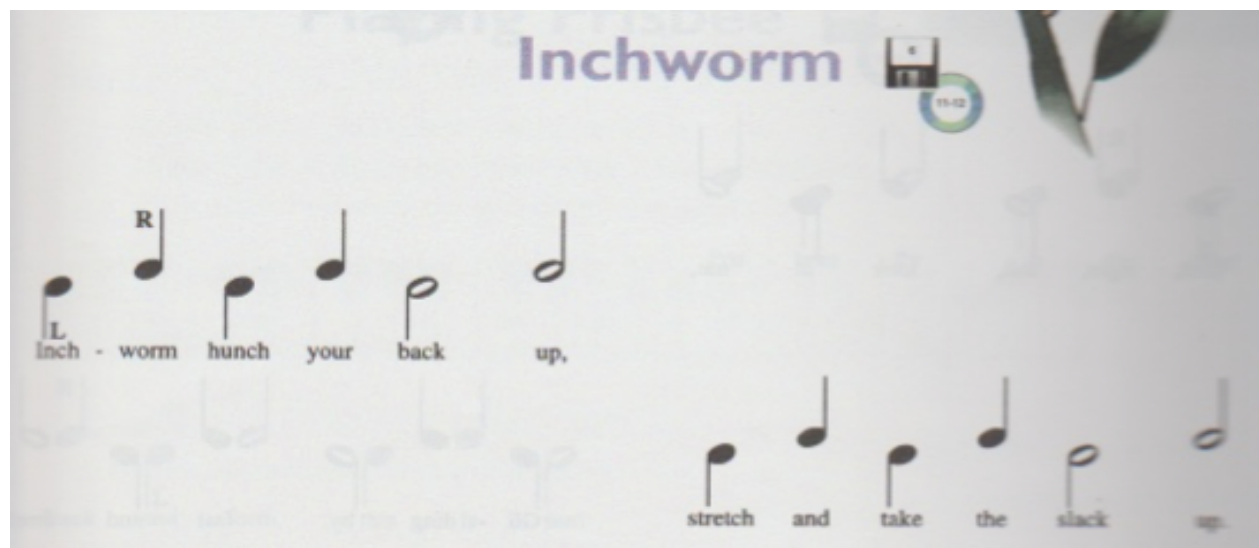


Figure 1. Adapted from “The Music Tree: Time To Begin,” by Clark, F., Goss, L., & Holland, S., p. 9. Copyright 2000 by Summy-Birchard Music.

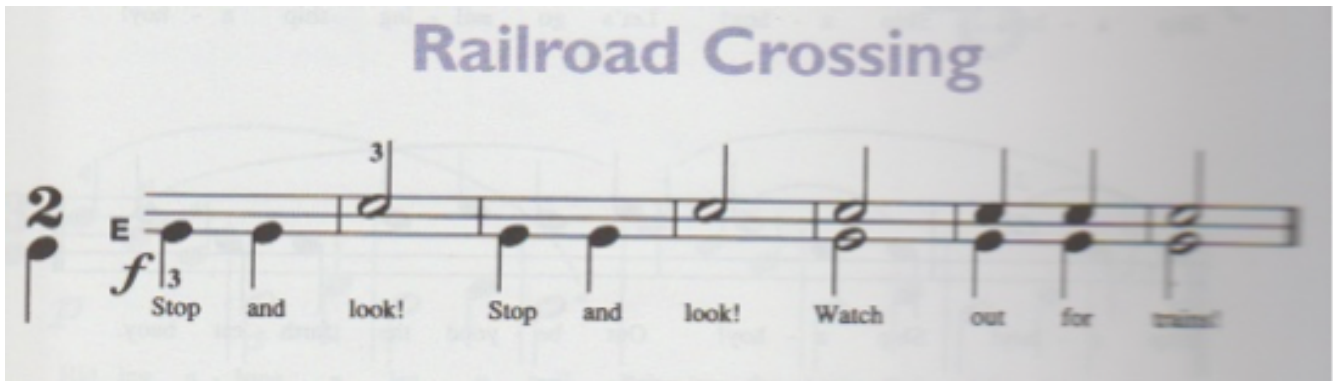


Figure 2. Adapted from “The Music Tree: Time To Begin,” by Clark, F., Goss, L., & Holland, S., p. 53. Copyright 2000 by Summy-Birchard Music.

The staff is introduced one line at a time allowing students to focus on one interval at a time (Jacobson, 2015). Intervallic reading is developed from landmarks such as bass clef F, middle C, and treble clef G where the students read intervals up and down from these landmarks (Bastien, 1995). Harmonic reading is also intervallic and the reading skills are enhanced by reinforcement of each new concept presented in various ways (Jacobson, 2015).

In recent years, the pure intervallic approach developed by Frances Clark has given way in popularity to what is commonly referred to as the eclectic approach. This mixed reading approach utilizes aspects of the three most prevalent reading approaches: middle C, intervallic and multi-key. Methods which use this approach also begin with off-staff notation. The staff is then introduced starting with middle C and the use of landmark notes are employed. New staff notes are introduced by interval (2nds, then 3rds etc.) which are presented on either the treble staff, the bass staff or the full grand staff. After all notes of C position are presented, the next set of pieces will move to another position. The mixed intervallic approach has been described as the way students should learn to read music (Fisher, 2010) and is an approach which combines the best aspects of the three reading approaches (Camp, 1992). For this comparative research paper, method books using the mixed intervallic approach will be used instead of the pure intervallic approach as the mixed intervallic approach is favoured by independent piano teachers (Camp, 1992).

Advantages and Disadvantages of the Intervallic Approach

The intervallic approach is promoted by many piano pedagogy textbooks and so there are a lot of comments and opinions about the advantages of this approach. The most widely accepted view is that the intervallic approach assists with the desirable skill of reading by direction or contour. When reading is approached from the concept of intervallic reading there is less of a chance that isolated reading habits will develop (Camp, 1992). This allows students to see the spatial relationships and patterns of note groupings (Jacobson, 2015). Reading by shapes and contours is important for beginners as the spatial relationships such as up, down or same are difficult (Bastien, 1995). If students do not recognize intervals they will struggle with large intervals or notes written above the staff (Klingenstein, 2009). As the complexity of music increases, interval recognition becomes an even greater tool in confident sight playing (Klingenstein, 2009). Interval reading of melodic phrases gives the student the ability to think, feel and hear the first note of a phrase and then react to subsequent notes (Chronister, 2005). The students' ability to do this fluently is important to musical playing and it eases the learning of new pieces and the skill of sight reading (Chronister, 2005). Uszler et al., (1995) list the advantages and disadvantages of the intervallic method:

Table 2

Advantages and Disadvantages of the Intervallic Approach

ADVANTAGES	DISADVANTAGES
Off staff directional reading allows students to read all over the keyboard from the start.	Student never gains a secure sense of location; too much freedom causes confusion.
Early intervallic recognition on a staff of less than 5 lines assures directional reading even before students need remember certain fixed guide notes.	Building up to reading on the grand staff is a slow process. Students can grasp the concept of pitch placement on the grand staff without this gradual procedure.
Since early reading is not based on recognition of patterns (other than intervals), student must look to the score for information about placement and fingering.	Bright, talented students may be able to work on their own, seeking information from the page, but average students need more direct repetition.
Off-staff or limited staff reading done on black keys tends to use fingers 2 and 3 or 2, 3 and 4. These fingers are most natural to use at the outset.	Delayed use of thumb and fifth fingers is unnecessary. Correct hand position must be developed with the whole hand from the beginning.

Table 2

Advantages and Disadvantages of the Intervallic Approach

From the start, music is played in many keys and ranges without use of 5 finger patterns or key signatures. There is variety of sound and effect.	Few folk or popular tunes are apt to be included in beginning music. Students (and parents) would rather hear familiar melodies.
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Harmonic reading is intervallic also. Blocked fifths, sixths, thirds, and so on prepare for reading and playing of 3-note chords.	Harmonic reading and playing is often delayed. Single-line (thin-textured) music is less satisfying to the student.
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Note. Adapted from “The Well-Tempered Keyboard Teacher,” by M. Uszler, S. Gordon and S. M. Smith, p. 6-7. Copyright 1991 by Schirmer Books.

This reading approach is supported by many piano pedagogy texts (Camp, 1992; Klingenstein, 2009; Agay, 1981; Fisher, 2010; Chronister, 2005; Clark, 1992; Bastien, 1995; Jacobson, 2015; Uszler et al., 1995) and so the disadvantages of this reading approach are not mentioned. Overall, these texts agree that starting beginner piano students with reading by direction or contour will develop strong reading skills which will translate to repertoire pieces and sight reading skills.

Chapter 1: Review of Literature

The review of literature will examine music reading as presented in scientific literature. Of particular interest to this study are the middle C and intervallic reading approaches often used to teach music reading during the first years of piano lessons. Scientific studies in this area are very limited so in order to fully investigate this topic I have included related research areas to broaden the context of the problem: teaching music reading, the sound before symbol approach, and music reading as presented in method books. Studies on the middle C and intervallic reading approaches, piano sight reading, and evaluation techniques used for piano sight reading will follow.

1.1 Teaching Music Reading

In general, there are not many scientific studies about teaching music reading and the author could not locate any studies on teaching music reading to beginner piano students. The studies which do exist are primarily focused on classroom teaching where music reading is centered around band instruments or singing. These studies focus on improving the instructional methods for music reading in schools of which many of the authors found the current methods to be substandard. Hewson (1966) states that “teachers of music reading are not satisfied with the objectives attained in their field, nor can they decide which instructional method would ultimately be most successful. In spite of the multiplicity of approaches to the basic teaching concepts, there is actually not a wide variety of methods” (p.289). This statement remains true today and is applicable to the field of piano teaching. These studies also indicate that current teaching methods are considered inadequate and lack certain elements such as aural training and kinesthetic activities which have been shown to improve music reading ability.

In order to improve music reading instruction Hewson (1966) devised a new instructional program which was based on the idea that children learn better from experience than from explanation. The new program established a functional way of reading music based on concept instead of theoretical knowledge and also provided a foundation for future theoretical knowledge. The experiment used the

following formula: play by ear, see or identify in notation, then read the new phrases along with previous material. The experimental method also included an approach to learning notational skills where tonality and key signatures were comprehended orally, by imitation, and by identification. Three classes of intermediate students were taught in a conventional way with three other classes taught using the experimental approach. Thirty-eight teachers listened to tape recordings of the participants and rated the sight reading ability of each of the groups. The students were rated on a 5 point scale. 93% of the evaluators rated the experimental groups above the conventional groups in sight reading and functional reading abilities. Although this study is dated, it is a rare example of an experimental study on a method for teaching music reading and highlights aural training as an avenue to assist in the development of reading skills.

Grutzmacher (1987) conducted a study which investigated the relationship of tonal pattern instruction using harmonization and vocalization to tonal concept development and performance achievement of beginning instrumentalists. The study compared two approaches; the first emphasized the use of specific tonal patterns taught through techniques of vocalization and harmonization while the other traditional approach emphasized technical skill and development with content consisting of musical symbols and music notes taught from notation. Grutzmacher states that most method books follow a traditional note-identification approach where pitches are isolated with notation presented one at a time as opposed to the tonal pattern approach. Instead, she argues that instrumental music students must first be guided in conceiving sound through the ear. 48 fifth and sixth grade students were randomly assigned to one of the two groups and received one 30 minute group lesson per week for 14 weeks. To measure the sight reading skills and tonal pattern recognition of the participants, the author used the following tests: *Iowa Tests of Musical Literacy Level 2*, *Tonal Aural Perception Test*, *Tonal Reading Recognition Test*, and *the Melodic Sight-reading Achievement Test*. The results showed that the tonal pattern group of students improved in melodic sight reading skills over those in the traditional approach. The total mean vector of the experimental group was $p < .0001$ over the control group. Also,

the tonal pattern group had a higher level of understanding of major and minor tonalities through listening, singing, and playing ($p < .0001$ higher) than the traditional group who were taught major and minor tonalities through the use of definitions and descriptors. Using the *Iowa Tests of Musical Literacy Level 2* and the *Melodic Sight-reading Achievement Test* as measuring tools, the experimental group displayed slightly higher scores in sight reading skills than the traditional group, however, there was no significant difference between the two groups in reading recognition. This is in contrast to the previous study which showed a larger difference in reading abilities with those given an aural training approach over the traditional notational approach.

In a related study, Kendall (1988) investigated two teaching approaches with beginning instrumentalists: the modelling mode which included aural and kinesthetic instruction, and the comprehensive mode which included aural, kinesthetic and visual instruction. The main difference between the two groups was that the comprehensive mode included music reading activities while the modelling mode did not. Kendall looked at two questions: 1) are there advantages to teaching students exclusively with modelling (demonstration and imitation) and, 2) does the process of learning to read music conflict with the development of aural and technical performance skills. The subjects were 76 fifth grade students in beginning elementary school bands all with no previous musical training and were tested after four months of lessons. The students were randomly assigned to either the modelling instruction group or the comprehensive instruction group. Four post-tests were administered to measure aural musicianship, instrumental performance and melody and rhythm sight-reading skills: *Instrumental Ear-to-Hand Coordination Test*, *Verbal Association Test*, *Instrumental Performance Test*, and the *Melodic and Rhythmic Sight-Reading Test*. Independent judges evaluated the tests of the participants. The results revealed that the introduction of music reading skills during the initial stages of instruction did not impede the development of ear-to-hand coordination skills and both modes of instruction were effective in the development of this aural musicianship skill. The comprehensive instruction was more effective in assisting students with the development of melodic verbal association skills as these students

were exposed to a complete learning cycle where the visual mode reinforced aural and kinesthetic experiences. Also, the students in the comprehensive mode developed better melodic and rhythmic reading skills as shown by the *Melodic and Rhythmic Sight-Reading Tests*. Overall this study shows that exposure to music reading activities during initial music instruction does not impede the development of aural musicianship or performance skills. These results show that an aural and kinesthetic approach to teaching music reading along with music reading activities may be an effective approach for beginning instrumentalists.

Another study looked at teaching music reading with conventional versus unconventional notation to grade one students using these two instructional methods. Klemish (1970) tested 102 grade one children from schools in Wisconsin. One group was taught using Method 1 which included aural discrimination tasks, the use of simple visual representations of tonal patterns, and the use of a pseudo notation (curved lines, dashes or other types of diagrams). The emphasis of Method 1 was on the recognition of patterns that had been sung or heard aurally then tasks to prepare the children for conventional notation. Children using Method 2 followed the same procedures as Method 1 but immediately used the music staff without the use of unconventional notation. Different techniques were used to reinforce learning in Method 1 such as forming patterns on a flannel board, chalkboard, and charts using large black lines. All groups played step bells to play the patterns with Method 1 children using hand and body movements to show melodic direction. The results showed that the effect of one method over the other was not significant. Some skills were better developed using Method 1 such as identification of melodic direction, aural matching and singing patterns. Method 2 showed higher scores for recognition of patterns, writing tones dictated from the piano and visual matching. Overall this study shows that there is no significant effect of using unconventional notation before using conventional notation when teaching music reading.

It is important to note that these studies which focus on the teaching of music reading are often testing an aural approach to music reading versus a notational approach. Currently in the body of

research available there is little which compares two reading approaches. This area of investigation could reveal what effects reading approaches have on the difference skills related to music reading. Another aspect lacking in music reading research are studies (longitudinal or otherwise) which use participants who are young and at the beginning stages of reading. Hodges (2011) remarks that among the few studies on teaching music reading, the findings are not consistent. He also observes that the studies available are not based on an underlying theory of music reading but rather on technique and teaching strategies. This is true of the aforementioned studies. There persists among piano teachers uncertainty when teaching music reading. Many teachers have encountered situations where a reading approach works well with one student but not at all with another. Teachers are generally armed with many diverse strategies when first introducing students to music reading but without a clear understanding or theory of how one learns to read music, it is difficult to develop effective strategies that will guarantee reading success with all students.

1.2 Sound Before Symbol Approach

The analogy between music reading and language reading is one that is commonly used in piano teaching. While language reading has been studied extensively, studies in music reading are still emerging. One point of view, which is often advocated by leading pedagogues in varying degrees, is that music learning should be presented to beginners in the same way that they experience language learning, through sound first, then symbol. Traditional piano teaching however has been rooted in reading methods where notation is often introduced at the very first lesson. The following studies present a brief overview of research which advocates for a period of aural training before the introduction of musical notation.

McPherson and Gabrielsson (2002) state, “proponents of the sound before sign approach argue that children will have difficulty learning to read notation unless their musical knowledge is sufficiently developed for them to be able to relate the sound of what they can already play with the symbols used to represent them” (p.99). They remark that throughout history leading instrumental teachers have

promoted the sound before sign approach yet in Western teaching tradition, children are introduced to musical notation from their first lessons. For example, James Mainwaring (an early 19th century music educator), believed that music students should be able to ‘think in sound’, the ability to inwardly hear and comprehend notation separately from the act of performance (McPherson & Gabrielsson, 2002). The authors comment that if a student’s attention is focused on reading notation they may have few cognitive resources left to devote to manipulating their instrument or listen to their playing. The main focus for the sound before sign argument is the idea that sensory and motor experiences should proceed the learning of symbols. The authors conclude with six general principles for teachers based on the work of Bruning, Schraw, and Ronning, (1999) which direct teachers to broaden the music reading experiences of students, draw from prior musical experiences, help readers work towards automatic decoding, encourage the development of musical knowledge, guide students through meaningful reading and to expect that children will vary in their reading development.

Gordon (1989) supports the idea that music reading is best approached through sound first before notation is introduced. Although music is not a language, since it does not have grammar, Gordon says that music has syntax which gives logical order to its sounds. Just as we read groupings of letters to discover meaning through language, we read groupings of notes (tonal patterns and rhythm patterns) to glean musical understanding (Gordon, 1997). The process for learning music therefore is similar to that of language, and in order to understand a piece of music, one must learn to audiate that music (Gordon, 1989). Audiation is defined by Gordon as what takes place when one hears and comprehends music silently, when the sound of the music is not physically present. One can audiate while listening to music, recalling music, performing music, creating music, reading music, and writing music. He states that one must be listening to at least five elements of the music at the same time; pitches moving up and down, the tonality of the music, the durations of the same or different lengths moving forward, the meter of the music and the tempo of the music (Gordon, 1989). In piano teaching, the opinion that music reading is the most important goal of lessons is extensive. Gordon suggests that reading music notation should be

an outcome of music instruction but the reading of music notation should be taught in proper sequence after the student is taught how and what to audiate. He goes so far to say that the introduction of notation should be delayed until a student can develop an extensive aural vocabulary of tonal and rhythmic patterns (Gordon, 1997).

Sloboda (1978) observes that the amount of attention devoted to music reading by teachers, educationalists, and psychologists has been very small yet the ability to read music is an irreplaceable asset to those involved in musical activities. His views on music reading are also in line with the previous studies. He states that “no-one would consider teaching a normal child to read while he was at a very early stage of learning spoken language. Yet it seems the norm to start children off on reading at the very first instrumental lesson without establishing the level of musical awareness already present. Without some musical knowledge a beginner has no expectancies which can be used in reading” (p.15). He writes that a good reader should appreciate the music ‘in his head’ without playing it at all. Before students can be trained in the reading of music, an attempt must be made to develop their musical sensibilities which include a knowledge of form and style and to have expectations which can be used when reading (Sloboda, 1978). Sloboda points out that the similarity of music to speech has been explored and there are clear behavioral analogies between language and music (Sloboda, 1976). Both language and music are comprised of sequences of sounds, vocal production and auditory perception, and both use “arbitrary visual symbols to notate salient aspects of the sound pattern” (p.2). He also remarks that the ability to read language with fluency and speed takes many years to develop much like music reading.

In a related study, Hahn (1987) compared the growth in music reading skills of string students taught to recognize notes in isolation with a group taught using a whole-to-part strategy. In her introduction, Hahn also comments on the language and music analogy saying that a person must speak a language for a long time before they start to read and write in that language and so music students should experience their language aurally before being introduced to notation. She also states that theories

describing the cognitive perception of language and music as parallel processes have been extensively explored and within these theories is an assumption of “innate cognitive systems of organization, described as ‘grammars’...which enable human beings to internalize, through experience, the rules of their language or music” (p.42). The subjects for the study were two beginning elementary string classes which were randomly assigned to either the control group or the experimental group. Both groups participated in preceding experiences such as rote singing and performance of tonal and rhythm patterns, rhythms games, and performance of simple, familiar melodies by rote. The control group began music reading with a string method book while the control group was introduced to notation through ‘road maps’: dots on the blackboard tracing the contour of tonal patterns and intervals. Next the experimental group was taught to distinguish between steps and skips by humming followed by the addition of rhythmic units. The results showed a significant difference in favour of the experimental group on the music reading and sight reading tasks. Since the experimental group had an aural experience where they learned to perceive melodic contours and rhythmic patterns and to predict the likely continuations of those patterns, these students were better able to read both familiar and unfamiliar notation.

In her article for the *Music Educators Journal*, Musco (2011) provides a sequence of instruction to enable good sight reading, fluent performance and promote transfer of learning. She comments that "method books facilitate the development of skills in reading music. However, many music teachers discover that advancing line by line through a method book is not always the best approach" (p.39). Musco offers a 5 step approach of instructional sequencing and rehearsal strategies with the first two steps most relevant for this review. In step one, students are prepared for reading notation through sound-before-sight instruction. Instructional activities include pattern training and playing by ear to help develop the basic kinesthetic facilities needed for fluent performances. Rote activities can be used to prepare students to “play by ear and improvise, where now the ears are used to realize the necessary fingering and the sound-action connection is strengthened” (p.60). Step two concerns the presentation of notation. She states that when presenting the music notation, “we seek to relate new information to what

the students already know, motivate student interest, and make memorable and relevant the musical symbol” (p.61). Musco suggests introducing new symbols through multiple learning modalities such as auditory, visual and tactile to address all types of learners. The final three steps: practice, persist and proceed are concerned with rehearsal strategies, creative repetition and the application of the acquired skills to new music.

Hansen and Milligan (2012) explored research examining the significance of aural discrimination skills in language and music learning. Like reading, a student’s first encounter with music is aural where one internalizes and discriminates between sounds. Reading specialists call this ‘phonological awareness’ which is the ability to understand the sounds of language which include the beginning and ending sounds of words, the individual words and the segmentation of words (Hansen and Milligan, 2012). Since the aural skills required for language are similar to those used in music learning, music training helps reinforce reading ability. They state that “while on the surface, music and language may not look and sound the same or express the same types of ideas, there are recognizable cognitive and developmental links between them. Language is the domain most comparable to music because both are organized temporally, and we perceive music and spoken language orally” (p.78). They also comment that ‘sound before symbol’ is an accepted view in music teaching and advocated by internationally recognized educators such as Zoltan Kodaly, John Feierabend, and Edwin Gordon.

The sound before symbol approach to music reading is well documented in research as seen by the studies in this section and in the Teaching Music Reading section of this review. This approach has been promoted as early as the 17th century with Couperin to leading music educators of today. What is interesting is the fact that most current Western piano teaching tradition mainly relies on method books to guide students through music reading where there are no sound before symbol strategies employed.

1.3 Music Reading Presented in Method Books

When teaching music reading, it is common for piano teachers to rely on beginner piano method books to guide students through the first stages of note identification and note reading. There is no

universal music reading method which teachers follow nor is there agreement as to which approach (middle C, multi-key or intervallic) or strategies (mnemonic devices, directional reading, flashcards) will guarantee note reading success. There are a plethora of piano method books available which can be used to introduce music reading to a beginner student. The method book selected will have a major influential role on the development of music reading skills and should be chosen with care. Gudmundsdottir (2010) states that the reading of staff notation is an important yet neglected field in music education research. Uszler (1992) also reiterates the point, “despite the profusion and diversity of piano methods, and the attention paid in pedagogy classes and elsewhere, there is no scientific research into the relative effectiveness of these methods, Here, indeed, is an area to which those engaged in pedagogical research must turn their attention.” Methods for teaching music reading skills are largely based on conventions. If students fail at fluency in music reading then teachers tend to rely on intuition rather than strategies based on scientific research.

Ballard (2007) analyzed several beginner piano method books to investigate elements of National Standards for music education (US) one of which was the development of skills for reading music. Her analysis showed that music reading skills were developed in the method books through major and minor keys and also through whole tone, pentatonic, and modal scales. She states that “although some methods were given high rating for music reading skills developed through a variety of repertoire...the quality of music was sometimes questionable” (p.75). Beginning piano methods do not properly prepare young students for 20th century piano literature and some contain the same literature as when they were first presented over 50 years ago. She also remarks that compositions in newer method books are at times not as appealing compared to older methods since more tuneful melodies can be played from the middle C approach versus the intervallic or multi-key approach. She suggests that students should be taught to read music in a way that experts process music when they play but does not offer any guidelines for this.

In a study looking at 3 method books, Chen (2013) analyzed their presentations of pre-reading, note reading, technique, rhythm and supplementary books. The methods used for the study were *The*

Music Tree (2000) by Frances Clark, Louise Goss, and Sam Holland, *Hal Leonard Student Library* series (1996) by Barbara Kreader, Fred Kern, Phillip Keveren, and Mona Rejino, and *Piano Adventures* (2003) by Nancy and Randall Faber. The author's analysis of pre-reading showed that *The Music Tree* used the most pre-reading pieces (55) compared to *Piano Adventures* and *Hal Leonard* with 15 and 16 respectively. There are no comments regarding pre-reading as to whether this approach is beneficial or necessary for students but comments that some piano teachers believe there is value in spending more time in pre-reading to prepare students for staff notation. In all three method books the first pieces are presented on the groups of two or three black keys. When beginning reading on the staff the methods use very different approaches. *Piano Adventures* introduces the grand staff and landmark notes, *Hal Leonard* introduces the treble staff followed by the bass staff, and *The Music Tree* introduces the staff in stages from 2 lines to 5. Of the three methods, *The Music Tree* uses a true intervallic approach. Chen shows how the method introduces the intervals in the order of 2nd, 5th, 3rd, and lastly the 4th as the interval of a 4th creates an uncomfortable hand position. According to Chen *Piano Adventures* and *Hal Leonard* use an eclectic approach drawing from the strengths of the top reading approaches, middle C, intervallic and multi-key. Overall, the study concludes that each of the three methods present strengths in different areas. Chen states that *The Music Tree*, as the pioneer of intervallic reading, is an excellent way to teach music reading. This comment however is based on the pedagogical belief that the intervallic approach is the most effective approach to music reading rather than on scientific evidence.

Another study by Huang (2007) analyzed piano method books to identify ways in which they were consistent with developmental characteristics of children. Although she does not directly analyze the method books for their reading approaches, she discusses reading as a general element. Early method books did not offer teachers sequenced instructions of how to teach music fundamentals nor did they provide any explanation of the reading process (Huang, 2007). During the 20th century method books began to present materials for reading and rhythmic skills in a systematic way. According to Huang, music reading involves interval recognition, relationships around groups of notes, and phrases and

sections in the context of the entire musical work. Music reading which involves intervals helps to develop aural imagery in the relationship of sounds. She offers 4 general elements of music reading (adapted from Richards (1996) and Chronister (1996)) which include pitch direction, keyboard topography from black keys to white keys, introduction of the musical alphabet, and learning keyboard anchoring points with notation on a staff system (either partial or grand). In general, the intervallic approach to music reading is promoted by this author and supported by leading pedagogues but no scientific reports were cited to support her comments.

Albergo (1998) compiled a list of common objectives for elementary level piano students derived from current beginner piano method books. She remarks that piano educators continually search for the most effective teaching strategies and there are many references made to the need for specific standards and objectives and the need for a more structured basis for organizing piano education. As piano methods become more systematized in their approaches to teaching the various elements of music to young students, teachers have begun to rely on the method book to provide the entire sequence of learning. She notes that leading pedagogues list as one of the main objectives for piano teachers is to have students reading music within a reasonable length of time, and that music reading is an important skill as it will carry over into one's adult life. Albergo also comments that reading objectives listed in pedagogy texts are not very specific and simply advocate that students should read fluently.

Nelson (2013) conducted a study to determine what order piano teachers of beginning piano students introduced musical concepts during the first year of study, what piano method books were used, and if the teachers were introducing musical concepts in line with the order used in the method books. She remarks that there is very little research to show if piano method books are effective and if any learning theories have been applied to the teaching of piano. In the traditional approach to piano teaching, reading music is the most important aspect with an emphasis on the musical performance of pieces. Nelson states that while the traditional method seeks to teach students to read music, there is much variation on how this is done. She provides examples such as whole versus partial staff, first

pieces on the white keys versus black keys, C position or no particular position. She asks pertinent questions regarding these decisions such as did any of the method book composers use a learning theory? Or what are the reasons why the books progress in the order they do? Like Albergo (1998), Nelson also remarks on the lack of universal standards for private piano teaching and the lack of a standard curriculum. In her historical review of piano methods she mentions that there are numerous books on how to play keyboard instruments but little written for the beginner or for the teacher on how to start a beginner. She states that “it was assumed the teacher would know how to start a beginner, would give all the necessary instruction for reading the music, and would find the appropriate materials for his/her students” (p.24). Nelson recommends that teachers research method books to see if the music symbols introduced and reinforced are helping or hindering music reading.

Analysis of method books provides valuable information for piano teachers. From these and other studies, a teacher can determine which method(s) best accommodates pedagogical issues such as age appropriateness or pacing of information for example. With respect to music reading, the studies included in this review highlight the need for empirical evidence. Since teachers depend heavily on methods books to lead students through the music reading process, it is vital that research be undertaken to provide supportive evidence for the reading approaches endorsed by method books. Piano teaching in general is a profession where one teaches as one has been taught or lessons are a series of preparing a student for the next performance, exam etc., or the teacher relies on the method book to give content and direction throughout the year (Albergo, 1998). Lomax comments “although note reading is such an important instructional objective that piano teaching methods are categorized by their approach to this concept, no studies exist which compare these approaches for teaching effectiveness” (p.44). Having scientific evidence to show which reading approaches are effective would positively impact the piano teaching field and in particular piano method books.

1.4 The Middle C and Intervallic Reading Methods

Numerous studies have been conducted on the topic of music reading but not many have looked at the topic of music reading acquisition for beginner piano students. Not surprisingly, only two studies were found investigating the effectiveness of the two most common reading approaches used by piano teachers, the middle C and intervallic approaches. This may be a result of the lack of an overall theory underlying music reading (Hodges, 2010) which would in itself provide insights into music reading acquisition and also provide a basis for further research in this area.

Emond and Comeau (2013) observed through a computer simulation the problem solving and decision making tasks involved in decoding a simple musical score. The middle C and intervallic reading approaches were tested to see how the different reading approaches impact the perceptual and motor processes. The authors used musical examples from two common piano method books; *The A.B.C. of Piano Playing* (Berlin, 1941) for the middle C approach and *The Music Tree* (Clark et al., 2000) for the intervallic approach. The results show that the middle C approach required less retrieval and execution planning time than the intervallic approach. This was explained by the fact that the middle C method has “a gradual introduction of musical note information” compared to the intervallic method. With the intervallic method, there is larger number of notes to be played over multiple octaves which demands more motor planning. During the simulation, the intervallic method showed a constant rate in planning time whereas the middle C approach required an increase in planning time. This increase in time could be due to the increase of notes presented in the middle C method whereas the intervallic method has more constant features for consideration such as location, duration and fingering.

Lomax (1990) examined the effectiveness of three popular reading approaches; middle C, interval/landmark and C-G position, to determine if one proved more efficient in teaching beginner piano students to read notation on the grand staff. Lomax remarks that each of the methods have been the subject of both criticism and praise with teachers writing many articles expounding on the virtues of each approach. However, none of the reading approaches “have been subjected to empirical research to

determine which is the most effective in teaching music reading to young beginners” (p.16). The study hypothesized that there would be no significant difference in note naming or location accuracy by students taught from either of the three reading approaches. Eighty-nine children from seven schools between the ages of 4 to 6 years old participated in the experiment. The musical instruction sessions were taught in a group format by the researcher in some cases and by volunteer teachers at the participating schools. The children were organized into small groups with each group utilizing one of the three selected reading approaches. After several weeks of instruction, the children were tested using a computer program designed specifically for the study. The program presented whole notes on the treble or bass staff and the subjects responded by pressing a note on the keyboard. The program recorded response accuracy and the time which elapsed from the presentation of the note to the playing of the note on the keyboard. The findings of the study confirmed the hypothesis with no difference found between each of the reading groups in note naming and note locating ability. The accuracy means for each group were as follows: interval/landmark group 69%, middle c group 67%, and the C-G position group 65%. Two main implications from this study can be derived from the results: the first suggests that note presentation order is not the main factor in ultimate reading achievement and the second suggests that “student success at note recognition is due to a combination of many teaching and methodological factors” (p.107). This study highlights the need for further research to discover what approaches and/or strategies will generate success with music reading at the beginner levels.

Even though pedagogues will attest to the importance of developing reading fluency during the first years of lessons, the analysis of music reading approaches commonly used by piano teachers is an area greatly neglected in music education research. Lomax makes an excellent point when she writes “piano teaching methods have traditionally been based upon the experience and opinions of a few respected pedagogues. The methods have not been subjected to experimental research to determine design effectiveness” (p.21). Many teachers have used a reading approach where students excel and while using the same reading approach, have students who struggle. The scientific examination of

reading approaches would assist in the better understanding of their strengths and weaknesses and benefit teachers in selecting approaches which would suit the needs of individual students.

1.5 Piano Sight Reading

There are numerous studies investigating the abilities of expert sight readers with research looking into various aspects of sight reading such as eye hand span, eye tracking, and pattern recognition. This research is valuable as the more we understand the processes utilized by expert readers for sight reading, the more we gain insight into how teachers should approach reading at the beginner level.

Eye-hand span or EHS is explained as the separation between eye position and hand position when sight reading music (Furneaux and Land, 1999). This research method has been borrowed from studies in language reading where it is referred to as eye-voice span or EVS (Buzas, 2015). With EHS, investigators track the amount of material, measured in number of notes, that can be correctly played following the note on which the text was made invisible (Sloboda, 1974). EHS for simple melodies for the average instrumental player is approximately 5 or 6 notes and varies with both expertise and the nature of the material to be read (Sloboda, 1984). Sloboda determined that good sight readers are aware of musical structures that link notes together into musical groups and also are able to look farther ahead when sight reading than poor readers (Sloboda, 1984). EHS was also studied by Truitt, Clifton, Pollatsek, and Rayner, (1997) where it was found that when sight reading, expert readers have larger EHSs than less skilled readers. Furneaux and Land (1999) also looked at EHS and showed that during the lag the printed score must be recognized, deciphered and processed. They suggest that the information is then stored within an internal buffer, with all material that is to be performed simultaneously also similarity processed. They explain that “if the span is too short, there will not be enough time to fully decipher and reassemble the required information. If this is too long, more information will have to be stored for longer, and as the buffer can only be of a limited capacity, loss or corruption of information is probable” (p.2435). The results of their study revealed that the buffer

increases in capacity as skill increases. The authors suggest that expert readers are "able to chunk several notes together and process them as a single unit of information, enabling them to store more in a buffer of similar capacity" (2439). This study shows that expert sight readers can store more information during sight reading than novice readers.

Research utilizing eye tracking as a tool enables the researcher to learn more about how expert readers are processing musical information. According to Buzas, Steklacs, Sagrillo, Marodi, and Devosa, (2015), research into eye tracking and professional music readers show that their eyes fixate on important musical structures "then glide towards less important details" (p.372). Their study looked at eye tracking in students between 10 and 14 years old from music schools in Luxembourg, Germany and Hungary. The students were given six different musical examples to perform while their eye movements were tracked. The results suggest that the knowledge of musical patterns strongly influences the duration and accuracy of a musical performance. In a related study by Goolsby (1994), six types of eye tracking was measured: number of progressive and regressive fixations, durations of progressive and regressive fixations and lengths of progressive and regressive fixations. The subjects were 24 graduate music students identified as either skilled or less skilled music readers. The findings of this study showed that skilled music readers use more eye movement in looking ahead then use more regressions to return to the point of performance while less skilled readers had longer regressive eye movements suggesting they were searching for information rather than using progressive eye movements to continue the performance. In a review by Madell and Hebert (2008) on eye movements and music reading, the authors studied eye movements used in text reading and compared it to that of music reading. They comment that studies on eye movements and text reading are successful since they use a fine-grained approach (using as its measurement basis a specific structural feature) as opposed to a coarse-grained approach where the study focuses on general characteristics. Madell and Hebert state that "a similar fine-grained approach in the music domain would offer equal promise for disclosing the cognitive

processes involved in music reading” (p.158). Therefore, with refined approaches in methodology, eye tracking studies can make valuable contributions to the existing research.

Studies in piano sight reading are diverse and explore many perspectives on what strategies are used by expert sight readers and how they differ from novice readers. Wolf (1976) interviewed four expert pianists about their sight reading process and strategies. The results from the interviews were then supported by scientific research in sight reading and also correlated with language reading studies. The results showed that musical sight reading was a task in pattern recognition with notes on a page serving the same function as letters in text reading. The musician processes larger configurations of notes into patterns as a text reader processes letters into words and phrases. Skilled sight readers will also search for visual cues which are familiar and will be able to process the cues automatically. Wolf proposes a cognitive model of sight reading which explains how the musical information is chunked and stored into long-term and short-term memory. In her review on sight reading studies Wristen (2005) also comments that the ability to recognize musical patterns and chunk information are strategies utilized by expert sight readers. These strategies allow expert readers to perceive multiple details of the musical score as a single piece of information.

Hardy (1992) conducted a two-phase study on sight reading. The first phase assessed the status of sight reading through a survey given to piano teachers. The results of this first study indicated that sight reading was not being addressed during piano lessons on a regular basis. Sight reading materials were under-utilized and sight reading instruction in general was haphazard without a consistent approach. During phase two the author administered a diagnostic/prescriptive sight reading program of her design to college level piano students. The results showed that the students using the program significantly improved their piano sight reading skills. Her analysis of sight reading studies indicated that the way a student first learns to read music may have a bearing on sight reading. She writes that many authors point out the advantages of directional or intervallic reading over note identification reading which later translates into the development of sight reading skills. Students taught by note

naming have a mechanical note for note sound while students taught by intervals possess a greater sense of musical flow in playing meaningful groups of notes.

In a study looking at factors which affect sight reading achievement, Kopiez and Lee (2008) hypothesized that sight reading achievement is the result of a combination of general and elementary cognitive skills as well as practice-related skills. The subjects of the study were 52 pianists of varying backgrounds; undergraduates, postgraduates, professional accompanists, and winners of sight reading competitions from the Hanover University of Music and Drama. The subjects were required to accompany a pre-recorded solo violinist on 5 different pieces increasing in difficulty. Twenty-three independent variables were divided into three categories; general cognitive skills which included working memory, short-term memory and short-term music-specific memory; elementary cognitive skills which included a number combination test, the measurement of auditory and visual reaction time, motor movement tasks of speed trilling and speed tapping; practice-dependent skills which included an inner hearing test and retrospective interviews about their music lessons and practice habits. The results showed that the elementary cognitive skills and practice variables are potential correlates of sight reading ability. The authors found that “there is a crucial time window for the acquisition of sight reading expertise. The number of accumulated hours of sight reading practice up to the age of 15 is the best predictor for sight reading achievement” (p.55). Furthermore, it was found that sight reading is more influenced by mental speed than by memory capacity or general intelligence. The authors suggest that practicing pattern recognition and chunking of note events is the easiest way to enhance information processing capacity and in turn, sight reading abilities.

The role of working memory capacity (WMC) and expert sight reading was investigated by Meinz and Hambrick (2010). Although studies on expert performance in domains such as music and sports show that deliberate practice is a major factor in gaining expertise, the authors question whether expert performance is a result solely of deliberate practice or whether heritable abilities such as WMC can affect expert performance. WMC is defined by Meinz and Hambrick as the ability to maintain task-

relevant information in a highly active state and is influenced substantially by genetic factors. For this study, participants were pianists demonstrating a wide range of skill who completed a sight reading test along with tests and questionnaires assessing deliberate practice and WMC. The results indicated that “deliberate practice accounted for nearly half the variance (45.1%) in sight reading performance. However, WMC accounted for a significant proportion of the variance (7.4%) above and beyond deliberate practice, and there was no evidence that deliberate practice reduced this effect” (p.917). This indicates that it is possible that a person can attain a high level of sight reading skill with many hours of deliberate practice but may be ultimately limited by WMC.

Studies investigating various aspects of sight reading have also used instrumentalists as participants to discover the cognitive processes of music reading or strategies employed by sight readers. For example, a study by McPherson (1994) investigated what factors and abilities influence sight reading by measuring the sight reading abilities of 101 high school clarinet and trumpet players. The results indicate that efficient sight reading is largely dependent on the capacity of the musician to read and comprehend rhythm. The interviews with the participants revealed that high scoring sight readers used the time to preview the sight reading material more effectively, displayed greater coordination and were able to identify familiar patterns versus the low scoring readers. This study supports previous research (Wolf, 1976) that good sight readers employ useful strategies such as observing the key and time signature of the piece, scanning the piece for patterns or obstacles, mentally rehearsing the piece before performing, and are able to anticipate the musical intent of the piece while performing.

Gromko (2004) investigated various cognitive abilities which could be predictors of sight reading ability in high school instrumental music students. Using near-transfer theory as a basis for the study (the idea that learning in one area can be transferred to or influence another area), Gromko hypothesized that skilled music reading could be predicted by a combination of cognitive abilities including comprehension in reading and math, spatial orientation and visualization, visual perception, and audiation of tonal and rhythmic patterns. The results of the study supported the hypothesis. Gromko

states that “music intelligence may draw on, and enhance development in, other domains bringing evidence in support of near-transfer effects of music instruction” (p.13). She remarks that students will improve reading and musical performance if they have logical strategies for decoding spatial and temporal aspects of musical notation before performing. In a similar study by Hayward and Gromko (2009), the authors hypothesized that speed and accuracy of music sight reading would be predicted by a combination of cognitive abilities such as aural pattern discrimination, spatial-temporal reasoning, and technical proficiency. Seventy wind players were tested for their abilities in sight reading, aural discrimination, and spatial visualization. The study found that “auditory, visual-spatial, and kinesthetic activations occur in coordination when wind players sight read musical notation” (p.33). This study shows how technical, aural and visual skills are required to work together to aid performers in sight reading tasks.

By studying expert readers and utilizing eye tracking technology, research into musical sight reading has revealed some of the cognitive processes and strategies utilized by expert performers. There is however, a need for studies investigating less experienced readers or those at the beginning stages of music reading. Studies on musical sight reading at the beginner level may provide correlations between music reading approaches and success with sight reading at later stages of reading development.

1.6 Evaluation of Piano Sight Reading

Music reading is a challenging subject to measure as there are so many parameters to consider. Studies evaluating music reading can include the measurement of accuracy of sight reading, error detection, eye tracking or various cognitive processes during music reading. Regrettably, the limited research concerned with measuring music reading lacks organization and clarity since the assessment methods cover diverse disciplines and may contain inconsistencies (Jensen, 2016). Especially sparse are studies evaluating sight reading at the piano of which the assessment methods vary greatly. For this research project sight reading is defined as “the ability to play music from a printed score or part for the first time without benefit of practice” (p.143), (Wolf, 1976). Since this research project is investigating

sight reading at the piano for beginner students, evaluation techniques for piano sight reading were explored.

The most common measurement tool used for sight reading is the Watkins-Farnum Performance Scale, (Watkins and Farnum, 1954) mainly used for brass and woodwind instruments. However, this evaluation method as it exists in its original form is unsuitable for measuring piano sight reading. Two studies have successfully adapted the Watkins-Farnum Performance Scale for piano sight reading (Lemay, 2008; Pike & Carter, 2010).

Lemay (2008) tested and compared three assessment methods used for sight reading; an adapted Watkins-Farnum Performance Scale (WFPS), Gilman's Scoring Algorithm and expert examiners, to see if they provide comparable analyses. Lemay created an adapted WFPS using newly composed musical examples suitable for piano sight reading ranging from 4 to 8 measures to resemble sight reading criteria set by the Royal Conservatory of Music (RCM), a national music exam institution. Also, the scoring system and error coding system was adapted to suit piano sight reading performance issues such as coordination between hands or pedaling. Eight participants were selected (11 to 16 years old) ranging in grades 6 to 9 RCM. All participants were instructed to sight read the musical examples starting with exercise 1 up to exercise 11 or until the pieces became too difficult. To compare the performances using the three assessment methods, only the first five exercises were used. The results indicated that the methods "differed greatly in their assessment procedures as well as in their assessment of subjects" (p.vii). The author remarks that there is a need for standardized measuring tools for evaluating piano sight reading.

Pike & Carter (2010) investigated the effect of chunking techniques on piano sight reading. Music majors were randomly assigned into three groups; one control group (A) and two experimental groups (B and C) where they were given rhythmic chunking drills or rhythm with pitch chunking drills. The students' sight reading was scored by two independent evaluators using a modified WFPS. The sight reading exercises were evaluated for "right hand rhythmic accuracy, left hand rhythmic accuracy,

right hand pitch accuracy, left hand pitch accuracy, and for continuity. Any hesitations longer than half a beat, reiterations of notes, or restarts counted as continuity errors” (p.238). The results displayed that there was no significant improvement in sight reading performance but there were significant improvements “in the subcategory of pitch” which occurred for both groups A and C. Both experimental groups made improvements in rhythm and continuity.

Another method used to measure piano sight reading is the use of expert evaluators. Lowder (1973) tested the sight reading of 23 college piano majors and analyzed their performances for errors. The sight reading tests were tape recorded and evaluated by class piano teachers on the faculty of the University of Indiana. The author does not provide the details of the measuring tool used for the sight reading test but states “to determine the mean number of subjects committing a pitch error at a particular point in a given example, the total number of errors recorded by each auditor for each subject was divided by the number of auditors” (p.70). Kornicke (1992), constructed a Sight-Reading Achievement Test (SRAT) which involved a questionnaire, interview and sight reading tasks. Five musical examples from advanced piano literature were administered to the participants all of which were piano majors. Expert evaluators were used to evaluate the performances using a Sight-Reading Performance Scale created by the author. A total of 32 items was used to evaluate each piece and were scored using a 5 point scale. The questions were organized into three categories of pitch, rhythm and interpretation. The author suggests that further research include studies for children where the SRAT could be appropriately modified. The use of expert examiners in the evaluation of sight reading has been a feature of conservatory examinations along with festivals and competitions. However, this method of measuring sight reading has shown very low assessment reliability (Lemay, 2008).

There is a need for further research evaluating piano sight reading and especially that which focuses on children or beginning readers. The results of these investigations may be used to develop pedagogical materials and methods for teachers, provide structure to the teaching of sight reading, and to promote the general activity of sight reading among young piano students.

1.7 Research Problem and Hypothesis

This study will compare the middle C and the mixed intervallic approaches on music reading acquisition in young beginner piano students. The research question is: After 10 months to 36 months of piano lessons, how do students compare with note and rhythmic accuracy when taught using the middle C approach versus the mixed intervallic approach? Participants will be given a series of tests on note recognition, pattern recognition and sight reading tests. Note recognition will be tested using two conditions: verbal note naming and single note playing. Note naming and note playing will be scored manually by the test administrator. Pattern recognition will be tested using two conditions; verbal pattern identification and multi-note pattern playing. Both conditions will be scored manually by the test administrator and analyzed for correctness. The performance of the sight reading tests will be analyzed using a scoring scale designed by the University of Ottawa Piano Pedagogy Research Laboratory the data for all tests will be entered in SPSS for analysis (Statistical Package for the Social Sciences).

I hypothesize that students taught using the middle C approach will perform better on the visual and physical note identification tests while students who have been taught using the mixed intervallic approach will perform better on the pattern recognition and sight reading tests. Although there is no previous research to base my hypothesis, there are several pedagogical texts which offer support: Jacobson (2015), Chronister (2005), Camp (1992), Agay (2004), Klingenstein (2009), Fisher (2010), Huang (2007), Wolf (1976), Hardy (1992).

Chapter 2: Methodology

The focus of this study is to compare music reading skills of young beginner piano students taught using the middle C approach versus students taught using the mixed intervallic reading approach. In order to study this subject, beginner piano students will be given a series of tests on note recognition (note naming and note playing), broken and solid intervals, 3 note pattern recognition (pattern and non-pattern playing) and sight reading. Participants may demonstrate significant differences in note recognition skills, interval identification skills, pattern identification skills, or sight reading skills, when taught with either the middle C or the mixed intervallic approach, thus, the results may provide evidence to show that one reading approach generates reliable skills over another.

2.1 Participants

A total of 22 students participated in the study (10 students represented the mixed intervallic approach and 12 students represented the middle C approach). The subjects were right-handed beginner piano students between the ages of 7 and 11 years old. Of the 22 participants only 20 participant results were included (participant 10 was left handed and participant 14 was over the age limit). All students had studied piano with an independent piano teacher ranging from 6 months to 3 ½ years. Students were recruited from 9 piano teachers in my local area of Niagara Falls, Ontario. All students were tested for right handedness and had no vision impairments (corrective glasses were accepted). The students were taught with method books representing the middle C approach (Piano Kids and Leila Fletcher) or the mixed intervallic approach (Piano Adventures, Wunderkeys, Carol Matz Interactive Method, Alfred's Basic Piano Library). This study used a non-random sampling of participants with 10 students representing each reading approach.

2.2 Design

Participants completed a series of tests appropriate for their age and performance ability to determine their handedness and to measure their skills in note recognition, pattern recognition, and sight

reading skills. The purpose of administering these tests was to determine if the teaching approach selected (middle C or mixed intervallic) impacted how students performed on basic note reading skills.

Handedness. Handedness was determined with a short survey where participants were asked which hand they used to complete four ordinary tasks. This survey questions were based on an existing handedness study by Annett (1970). Right handed students were included in the study. (See Appendix 1)

Keyboard Identification. Familiarity with the piano keyboard was tested. A picture of a keyboard was shown through a computer software program in a flashcard-like presentation. A red dot was placed on one of the keys. When the picture appeared on the screen, participants were asked to verbally name the key which had the red dot as soon as they were able. Each keyboard picture appeared on the screen for 1 second. Students had 2 seconds to verbally provide an answer before the next picture was shown. I collected the data manually on a scoring sheet and each student was video recorded.

Single Note Recognition (Verbal). Students performed note recognition tests where they verbally named staff notes. Each test was administered to the participant through a computer software program in a flashcard-like presentation. First notes were presented in the treble clef then bass clef. Each note appeared on the screen for 1 second. Students had 2 seconds to verbally name the note before the next note was presented. The participant responses were collected manually on a scoring sheet and each student was video recorded. (See Appendix 2)

Single Note Recognition (Playing). Students performed note recognition tests where they played single notes with their right hand. The first 5 notes of C position (C, D, E, F, G) were presented randomly followed by the first 5 notes of G position (G, A, B, C, D). Each test was administered to the participant through a computer software program in a flashcard-like presentation. Each note appeared on the screen for 1 second with a 2 second delay before the next stimuli. I collected the data manually on a scoring sheet and each student was video recorded.

Note Recognition (Broken Intervals). Students performed note recognition tests where they played broken intervals with their right hand. First a two-note broken interval in C position were

presented followed by a two-note broken interval in G position. Each test was administered to the participant through a computer software program in a flashcard-like presentation. The intervals appeared on the screen for 2 seconds. Students had 3 seconds to play the broken interval on the keyboard before the next interval was presented. I recorded the note names of each interval performed by the participants manually on a scoring sheet and each student was video recorded. (See Appendix 3)

Note Recognition (Solid Intervals). Students performed note recognition tests where they played solid intervals with their right hand. First a two-note solid interval in C position were presented followed by a two-note solid interval in G position. Each test was administered to the participant through a computer software program in a flashcard-like presentation. The intervals appeared on the screen for 2 seconds. Students had 3 seconds to play the solid interval on the keyboard before the next interval was presented. I recorded the note names of each interval performed by the participants manually on a scoring sheet and each student was video recorded.

Pattern Recognition (3 Notes). Students performed pattern recognition tests where they played 3 note patterns or non-patterns with their right hand. Patterns were a series of 3 notes that created a triad such as C-E-G or a succession of notes such as C-D-E. Non-patterns were a series of 3 notes that did not create a triad or succession of notes such as G-D-E. First, patterns or non-patterns created with the notes of C position were presented followed by G position. Each test was administered to the participant through a computer software program in a flashcard-like presentation. The 3 note patterns or non-patterns appeared on the screen for 2 seconds. They were displayed melodically on the treble staff. Participants had 3 seconds to play the presented pattern or non-pattern before the next stimuli appeared on the screen. I recorded the notes played by each participant manually on a scoring sheet and each student was video recorded.

Sight Reading (Without Rehearsal). Participants were asked to sight read a four-bar piano piece in C major with alternating hands. This piece (A-1) was selected from a collection of sight reading

pieces composed by Mary Gardiner for the University of Ottawa Piano Lab which are used as measuring tools for sight reading. (See Appendix 4)

Sight Reading (With Rehearsal). The participant sight read two pieces; once (without prior rehearsal), then will practice the piece two times, and lastly will perform the rehearsed piece one final time. Two pieces will be used for this test each 4 bars in length in the keys of F major and G Major. The pieces (B-1 and B-2) are selected from a collection of sight reading pieces composed by Mary Gardiner for the University of Ottawa Piano Lab to be used as measuring tools for sight reading. (See Appendix 5)

All sight reading performances were recorded by iPad Pro. The recordings of the performances were reviewed and used to score each participant. The scoring scale used for this test was provided by the University of Ottawa Piano Pedagogy Research Laboratory. (See Appendix 6)

Table 3

Descriptions of Music Reading Tests

Handedness	Participants are asked which hand they use to complete 4 ordinary tasks.
Keyboard Identification	Participants are asked to verbally identify notes of the keyboard.
Note Recognition-verbal	Participants are asked to name notes presented on a musical staff in the treble and bass clef.
Note Recognition-playing	Participants are asked to play notes presented in treble clef in C position then G position with the right hand.
Note Recognition broken intervals	Participants are asked to play 2 note broken intervals in C position then G position with the right hand.
Note Recognition-solid intervals	Participants are asked to play 2 note solid intervals in C position then G position with the right hand.

Pattern Recognition-3 notes broken	Participants are asked to play 3 note broken patterns in C position then G position with the right hand.
Sight Reading-without rehearsal	Participants are asked to sight read a short piano passage appropriate to their level. They will perform the piece once without any rehearsal. (A-1)
Sight Reading-with rehearsal	Participants are asked to sight read a short piano passage appropriate to their level. They will rehearse the piece 2 times then perform in one final time. (B-1, B-2))

2.3 Apparatus

The students performed on a Yamaha P-25 digital piano. Performance data for keyboard identification, note recognition, interval recognition, and pattern recognition tests was manually recorded on answer sheets. Performance data for sight reading tests was video recorded. A computer software program on a MacBook Air laptop was used to display the following tests: keyboard identification, verbal note identification (treble clef then bass clef), single note playing (treble clef then bass clef), broken intervals (C position then G position), solid intervals (C position then G position), 3 note patterns (C position then G position). The laptop screen was 13.3 inches in diameter and was placed 20 inches away from the participant. Sight reading material was presented in the form of sheet music. All testing sessions were recorded on an iPad Pro. The recordings of each participant were reviewed and used to ensure all manually recorded data was accurate. For the sight reading tests, the recordings were used to score each participants' performance.

2.4 Procedure

The students were greeted at the home studio of Alessandra DiCienzo and brought to the music room. All parents and participating students were required to read and sign a consent form approved by the Ethics committee of the University of Ottawa. The testing session was explained to them before we began, and they were free to ask any questions. All testing sessions were recorded by iPad Pro which was focused on the participants hands and the music. Verbal tests were recorded manually on an answer

sheet as well as by video recording. The tests were conducted in the following order: handedness, keyboard identification, single note recognition (verbal), single note recognition (playing), broken intervals (C then G position), solid intervals (C then G position), 3 note patterns (C then G position), sight reading without rehearsal (A1), verbal note naming (A-1), and sight reading with rehearsal (B-1 and B-2). Upon completing all the tests, the students were thanked for their time and participation in the study and were escorted out of the studio. Four students were tested using a similar procedure at the Whitby School of Music in Whitby, Ontario.

2.5 Data Analysis

As mentioned previously, the data for the verbal and physical pattern recognition tests and note identification tests was collected manually on an answer sheet for each participant. The data for the sight reading and rehearsed reading tests was scored by myself using a scoring scale designed and provided by the University of Ottawa Piano Lab. Participant responses for keyboard identification, note recognition tests, broken and solid intervals, and pattern recognition tests were entered into excel documents under the following headings: participant ID, age, years played, stimulus, response, correct/partially correct/incorrect, response description, partially correct description, hesitation (yes or no). Sight reading responses were entered under the following headings: participant ID, age, years played, piece, pitch errors: wrong note, addition, note/rest missing, restriking, repetition of a group of notes, and total pitch errors. The data was analyzed using the Mann-Whitney U test. Supporting data analysis for sight reading was done by tabulating pitch errors for each heading and calculating total pitch errors.

Chapter 3: Results

3.1 Demographic Results

The total number of participants was 22 with 10 students representing the mixed intervallic approach and 10 representing the middle C approach. In order to create a meaningful analysis of the test results, the participants were organized into two groups: grade 1-3 students and pre-grade 1 students. The grade 1-3 group had a total of 7 students (3 mixed intervallic participants and 4 middle C participants). For mixed intervallic students, two were in grade 1 and one student in grade 2. For the middle C participants, two were in grade 2 and two in grade 3. Owing to the small number of participants, a statistical analysis was not possible for this group so no other results will be reported on regarding this group. The pre-grade 1 participant group consisted of 7 mixed intervallic students and 6 middle C students. (See Table 4)

Table 4.

Teacher and Participant demographics

Teacher	Method Book	Approach	Participant ID
Teacher A	Piano Adventures	Mixed Intervallic	18
Teacher A	Carol Matz	Mixed Intervallic	19
Teacher B	Wunderkeys	Mixed Intervallic	11
Teacher B	Piano Adventures	Mixed Intervallic	12
Teacher C	Piano Adventures	Mixed Intervallic	1, 2, 6
Teacher D	Pianokids	Middle C	5, 7, 21, 22
Teacher E	Fletcher	Middle C	4
Teacher F	Pianokids	Middle C	15

Assigning a level to each participant was challenging as each method book series uses a different labeling system for ordering the progression of books. The mixed intervallic method levels ranged from primer to conservatory introductory pre-grade 1 and the middle C method levels ranged from level 1 – 3. In order to generate a mean level to assist with the analysis, a number was assigned to each method book level: 1= primer book 1, 2= primer book 2, 3=1st post primer book, 4=2nd post primer book, 5=3rd post primer book. See Table 5 for a comparison of the groups’ age, years playing piano and current level.

Table 5.

Demographic Statistics Pre-grade 1 (intervallic: n=7, middle C: n=6)

		Min	Max	Mean	SD
Age	Intervallic	7.0	11.0	8.86	1.57
	Middle C	7.0	9.0	8.00	0.63
Years Played	Intervallic	0.7	3.5	2.02	1.00
	Middle C	0.7	2.0	1.36	0.56
Level	Intervallic	2.0	5.0	3.71	1.11
	Middle C	1.0	5.0	3.50	1.38

The average age between the two groups was similar for both approaches; 8.86 years for the mixed intervallic group and 8 years for the middle C group. The mean age for both groups corresponds to what is considered the ‘average age’ to begin piano lessons. According to Bastien (1995), the average age beginner piano student is between seven to ten years old. Jacobson (2015) also states that the majority of students begin piano lessons between the ages of seven and nine. This is also reiterated by Uzler et, al., (1991) who write that the average age piano student is seven or eight years old.

The intervallic group had slightly more experience in playing with a mean score of 2.02 years over the middle C group of 1.36 years. The mean level for each group was also very similar with 3.71 for the mixed intervallic group compared to 3.50 for the middle C group. Overall, the students in the

study represent typical beginner piano students as shown by the years played and average level of the two groups. Beginner piano students, sometimes referred to as early elementary, are generally those with 2 years or less of piano instruction. Bastien (1995) describes second year students as those who are beyond the basics but are still developing beginning skills at the elementary level. In a similar sentiment, Uzler et. al., (1991) classify beginners as those with 1 or 2 years of instruction and consider students with 3 to 5 years of instruction as intermediate level (often subdivided into early, middle and late intermediate). Both texts discuss many factors which affect a student’s progression through levelled method books which include, but are not limited to, student age, intelligence and quality of practice.

3.2 Test Results for Note Identification and Note Playing

The results for keyboard identification, note naming, note playing, broken intervals, solid intervals, 3-note patterns were compared. For each test, a score (percent of correct responses) was calculated for each participant. The score distribution was non-normal, therefore a non-parametric test (Mann-Whitney U test) was used to compare the two groups. The median scores were generated by looking at only correct responses either verbally provided by the participants or played by the participants. See Table 6 for the median scores, and results of the Mann-Whitney U test.

Table 6.
Statistical Results

Test	Subtest	Median Intervallic	Median Middle C	U	Z	P
Keyboard naming		60%	55%	20.5	-0.073	0.942
Note naming	Treble	14%	25%	15.5	-0.799	0.424
	Bass	7%	21%	12	-1.33	0.183
Note Playing	C position	38%	50%	20.5	-0.074	0.941
	G position	38%	44%	10.5	-0.325	0.745
Intervals (broken)	C position	13%	37%	15	-0.867	0.386
	G position	13%	30%	4	-1.482	0.138
Intervals (solid)	C position	0%	38%	15	-0.935	0.350
	G position	13%	19%	7.5	-0.643	0.521
3-note patterns	C position	14%	10%	11	-0.323	0.746
	G position	10%	38%	1.5	-1.328	0.184

For all tests, no statistical significance between the two groups was found due to the low number of participants. However, with larger numbers one might have seen a significance in the results. When looking at the median scores for each test, the middle C group outperformed the intervallic group on most tests. The mixed intervallic group performed slightly better than the middle C group on keyboard identification and 3 note patterns in C position.

As was expected, the middle C group performed better on note naming and note playing. These two tasks are considered strengths of the middle C approach. Uzler, et al., (1995), list one of the advantages of this approach as the ability to find pitch names and piano key locations easily. Jacobson (2015) describes middle C approach as one where note reading is dependent upon individual note recognition. Since this approach is centered on the middle C hand position, note naming and playing in this position scored higher than the same tasks in G position. Considering the mixed intervallic approach focuses on patterns or note groupings (Jacobson, 2015), these students were not expected to outperform the middle C group on single note naming and playing.

The results for broken and solid intervals are very surprising. In view of the fact that most pedagogy texts support and endorse the mixed intervallic approach, one would have expected this group to score much higher in these tasks, and perhaps, to even outperform the middle C group. The intervallic reading approach allows students to see the spatial relationships and patterns of note groupings (Jacobson, 2015) and so one would expect this aspect of reading to be strongly developed within the mixed intervallic group. Further analysis was conducted to see if the mixed intervallic group was reading the correct interval but played on incorrect keys (See Table 7).

Table 7.
Number and Percent of Responses for Correct Interval but Wrong Note

Subtest	Group	% of responses	No. of responses
Broken Intervals C Position	Mixed Intervallic	3%	3
	Middle C	0%	0
Broken Intervals G Position	Mixed Intervallic	21%	16
	Middle C	7%	4
Solid Intervals C Position	Mixed Intervallic	5%	3
	Middle C	0%	0
Solid Intervals G Position	Mixed Intervallic	13%	5
	Middle C	6%	2

As can be seen from the results, the mixed intervallic students more often played the correct interval but incorrect notes than the middle C students. This happened at a greater rate in G position than in C position for both solid and interval playing. Since note recognition for mixed intervallic students is weaker in G position, these results could be showing that the mixed intervallic students are reading more by interval in these cases.

One would expect the middle C students to perform well on 3 note patterns in C position, however, the results are showing the mixed intervallic group performing slightly better. The middle C group performed much better in G position compared to the mixed intervallic group. This effect could be explained by the fact that the middle C group method books (Fletcher, Pianokids) provide more pieces in G position than the mixed intervallic method books (Matz, Wunderkeys, Piano Adventures, RCM Prep B) and the middle C method books introduce G position sooner than the mixed intervallic methods.

3.3 Test Results for Sight Reading

The results for A-1 sight reading performances were rated by tabulating the number of pitch errors committed by each participant. Since this study is looking at music reading, specifically note and pattern recognition, timing errors were not considered. The ability of the participants to play correct pitches, and to recognize intervals and patterns was the primary focus of the sight reading analysis. Not many of the pre-grade 1 participants were able to complete all the sight reading tests so results from B-1 and B-2 were not used. Pitch error categories were as follows: wrong note, note addition, note/rest missing, restriking, repetition of a group of notes. Note naming was also scored where participants verbally named each note of the A-1 sight reading piece. Table 8 shows the comparison of the two groups' sight-reading results using the Mann-Whitney U test. In addition to the note playing errors, the note naming results are shown.

Table 8.
Sight Reading Statistical Results

Test	Median Intervallic	Median Middle C	U	Z	P
Sight reading pitch errors	5.50	5.00	14.5	-0.564	0.572
Sight reading note Naming (% correct)	0.57	0.68	11	-1.449	0.147

Looking at the sight reading pitch errors (playing), the median score of A-1 was nearly identical for each group with the middle C group making slightly fewer errors than the mixed intervallic group. This stronger showing from the mixed intervallic group may be the result of intervallic reading skills (reading by groups of notes) which positively influenced their performance. The middle C group performed better than the mixed intervallic group on the A-1 verbal note naming task. This may be because the sight reading piece A-1 is written using the shared middle C position, which may have given the middle C group an advantage over the mixed intervallic group.

The most common pitch error among all the participants regardless of approach was wrong notes. Six participants from each approach attempted A-1 (participant 11 was not able to perform the piece).

The total number of wrong notes for both the mixed intervallic group and the middle C group was 28. In general, the mixed intervallic group had more total errors: 38 total errors, over the middle C group: 28 total errors. (See Table 9 for mixed intervallic participants and Table 10 for middle C participants)

Table 9.
Sight Reading Errors for Mixed Intervallic Participants

Part. ID	Wrong Note	Addition	Note/Rest Missing	Restriking	Repetition of a group of notes	Total Errors
1	6					6
2	4	1				5
6	3			1		4
12	7		1			8
18	7	1	1	1		10
19	1	1	2	1		5
Total	28	3	4	3		38

Table 10.
Sight Reading Errors for Middle C Participants

Part. ID	Wrong Note	Addition	Note/Rest Missing	Restriking	Repetition of a group of notes	Total Errors
4	2					2
5	0		1			1
7	0		1			1
15	2			1	1	5
21	10					10
22	9					9
Total	23	0	2	2	1	28

For students with wrong notes, the most common area of difficulty in the piece occurred where there was a slight change in hand position in the right hand. Students began in shared middle C position but had to tuck finger 1 of right hand under to F4 to reach A4 which was out of the C five finger position. Another challenging area was the end of the piece with had students move down a fifth from G3 to C3. Students had to tuck finger 1 of left hand to G3 to change hand position. Most students in both groups failed to follow the fingering suggestions marked on the score.

3.4 Results for Teacher Effect

There was the possibility that the students of one teacher were influencing the results. In order to rule out teacher effect as a factor, individual participant results of the pre-grade 1 group were compared to see if students of one particular teacher were skewing the results in favour of one approach over another. (See Table 11 and 12).

Table 11.
Teacher and Participant Demographics

	Teacher A	Teacher B	Teacher C	Teacher D	Teacher E	Teacher F
Participant	18, 19	11, 12	1, 2, 6	5, 7, 21, 22	4	15

Table 12.
Teacher Effect

Part. ID	Kb Ident.	Treble Note Naming	Bass Note Naming	C pos. Note playing	G pos. Note Playing	Broken Intervals C pos.	Broken Intervals G pos.	Solid Intervals C pos.	Solid Intervals G pos.	3 notes C pos	3 Notes G pos	A1
18	0.70	0.21	0.07	0.50	0.00	0.00	NA*	0.13	NA	0.00	NA	0.64
19	0.90	0.14	0.07	0.38	0.25	0.40	0.13	0.00	0.25	0.40	0.13	0.57
11	0.10	0.07	0.07	0.38	NA	0.00	NA	0.38	NA	0.00	NA	0.36
12	0.55	0.00	0.00	0.38	0.75	0.07	0.00	0.00	0.00	0.07	0.00	0.57
1	0.60	0.64	0.36	0.38	0.63	0.13	0.07	0.00	0.38	NA	NA	0.64
2	0.90	0.25	0.21	0.75	0.50	0.47	0.33	0.13	0.13	NA	NA	0.50
6	0.30	0.14	0.14	0.38	0.25	0.20	0.27	0.00	0.13	0.20	0.27	0.50
5	0.65	0.36	0.07	0.75	0.19	0.93	0.27	0.75	0.25	0.93	0.27	0.64
7	0.55	0.14	0.21	0.25	NA	0.00	NA	0.00	NA	0.00	NA	0.71
21	0.10	0.07	0.21	0.19	0.25	0.07	0.20	0.00	0.13	0.07	0.20	0.14
22	0.30	0.14	0.07	0.25	NA	0.07	NA	0.00	NA	0.07	NA	0.57
4	0.90	0.50	0.50	1.00	0.63	0.67	0.33	0.88	0.13	NA	NA	1.00
15	1.00	0.79	0.93	1.00	0.94	0.87	0.53	0.75	0.50	0.87	0.53	1.00

There was a large amount of variability in the test scores of the participants which indicated that teacher effect was not a factor in influencing the overall results.

Chapter 4: Discussion

This study compared the music reading skills of young beginner piano students who were taught using either the middle C approach or the mixed intervallic approach. I hypothesized that the middle C students would perform better at single note identification while the mixed intervallic students would perform better at interval and pattern recognition and sight reading. This hypothesis was based on piano pedagogy texts which describe the intervallic approach as an ideal way for students to read music. With this approach, students read by interval or pattern which aids in sight reading and fluidity in playing (Camp, 1992; Klingenstein, 2009; Agay, 1981; Fisher, 2010; Chronister, 2005; Clark, 1992; Bastien, 1995; Jacobson, 2015; Uszler et al., 1995). The results of the study showed no statistical significance between the two groups because the sample size of the participants was too small. With a larger number of participants, one would have seen more statistical results. The median scores for each test however, revealed the middle C students performed better on most of the music reading tests: single note reading identification (verbal and playing), solid and broken interval playing, 3 note patterns in G position and sight reading. The mixed intervallic students performed better on keyboard identification and 3 note patterns in G position. It is interesting that the middle C students outperformed the mixed intervallic group on interval and pattern recognition; two aspects of reading which are the purported strengths of the mixed intervallic methods.

It was to be expected that the middle C participants would do better than the mixed intervallic participants in single note identification in both conditions. It was not expected to see this group do better in solid and broken interval playing (C and G position) over the mixed intervallic group. Considering mixed intervallic methods emphasize this aspect of music reading, it is surprising that their scores were so low. One possible reason for this result may be because mixed intervallic method books spend more time in pre-reading exercises before introducing staff notes. When staff notes are introduced, they are done so at a slower pace compared to the middle C method books which begin staff

reading from the first page and introduce more notes at once. Therefore, middle C students at the pre-grade 1 level would have more experience in staff reading compared to mixed intervallic students.

The mixed intervallic group performed slightly better on 3 note patterns in C position over the middle C group. This may be explained by the pacing of mixed intervallic method books. The first method books used by students in the study either did not have pieces in the G position or introduced G position at the very end. Even at subsequent levels, the books began in C position then presented pieces in G position approximately at the midway point. The middle C method books had no pieces in G position in the first book, then presented pieces in G position starting in book 2 and onwards of both series. The middle C method books also had an equal number of pieces in C and G position. Therefore, students using mixed intervallic approaches are spending more time playing in C position compared to the middle C students which may explain why they performed well with 3 note patterns in C position but not G position.

Another surprising result was the middle C group performing slightly better on sight reading compared to the mixed intervallic group. Overall the middle C students played more correct notes than the mixed intervallic group and made fewer total errors. This finding is interesting as one of the cited reasons for using the mixed intervallic method is that interval recognition aids students in sight reading (Klingenstein, 2009; Chronister, 2005). Since the piece used for the sight reading analysis (A-1) was in C position, it is possible that the middle C students, who have more experience playing staff notes compared to the mixed intervallic students, were more confident in note recognition and therefore made fewer note errors. In general, one would have expected the mixed intervallic group to perform much better on the interval tasks considering learning to read by interval is the main focus of these approaches.

Chapter 6: Conclusion

Developing fluency in music reading is one of the most important skills for the beginner piano student. It is often however, one of the most difficult to acquire. Piano method books can assist in this task by offering various approaches to the teaching of music reading. This study tested music reading skills among young beginner piano students taught using either the mixed intervallic approach or the middle C approach to see if one approach was generating more reliable reading skills over another. I hypothesized that the mixed intervallic students would perform better on music reading over the middle C students. Although there are no scientific studies looking at the music reading skills of beginner piano students using these approaches, current pedagogy promotes the mixed intervallic approach. Through simple music reading tasks which included recognition of keyboard notes, treble and bass notes, intervals, patterns, and sight reading, it was found that the middle C students performed better on most tests compared to the mixed intervallic students. It should be noted that when playing intervals, the mixed intervallic students were often found to play the correct interval but incorrect notes which may indicate that intervallic reading was taking place. Also, the mixed intervallic group performed well on the A-1 sight reading task scoring slightly under the middle C group which may also indicate the presence of intervallic reading.

Limitations of the Study

This study looked at 22 beginner piano students from 7-11 years old who were studying piano from 6 months to 3 years. The students were then subdivided into pre-grade 1 students (13 students) and students in grades 1-3 (7 students). The pre-grade 1 group was too small to see any significance in the results while the grade 1-3 group was too small and varied for analysis. Owing to the small numbers of students it was not possible to see the progression of each method as students moved into higher levels of each series or even into early conservatory levels. Interesting questions arise which may be answered with larger participant samples: Are the differences between the approaches still evident? If so, are they

more pronounced? Are errors made in sight reading similar between early readers and readers with a few more years of experience? There is a need for research which focuses on young beginner students. The first years of piano lessons are crucial as they set the stage for successful development in all areas of music such as proficient reading skills.

An important factor which may have affected the outcome is the effect of the individual teaching strategies (note reading drills, flash cards, worksheets etc.) employed by each teacher which may have influenced the reading skills of particular participants. Many teachers reinforce note reading with the use of flashcards, worksheets, or note spellers. Some method books have built in note review exercises or accompanying theory books which teachers may use with students. Tablet applications used for note review or sight reading may be used by the teacher in the lesson or even used by the students at home during regular daily practice. Some teachers may supplement the method book with extra material taken from different sources. These students may have more reading experience than a student who was only playing pieces provided by the method book.

General IQ and aptitude for music reading and piano playing was not addressed in the selection of the participants. It is possible that some of the participants might demonstrate a high IQ or high aptitude for music which might give them an advantage over other participants.

Suggestions for Future Studies

The results of this study are intriguing as current pedagogy promotes the benefits of intervallic reading and many method books available use the mixed intervallic approach. Further studies are required using larger sample sizes to see if the results of this study would be replicated. Studies with children of similar ages and levels would also generate more reliable results. The use of one method book to represent each reading approach would also help to lessen the number of variables effecting the results. Furthermore, participants who are using the same method book allows for more precision when assigning a level to each student. A similar study with the addition of a teacher interview or questionnaire would help to control teacher effect variables if using larger sample sizes. It would be

helpful when interpreting the results to know if teachers are using specific reading strategies with their students or are employing unique approaches to assist with music reading along with the chosen method book. A study testing the reading skills of participants at the pre-grade 1 level, then again at later levels of piano study would be valuable. Does the trend continue or does the difference decrease with time? It may be interesting to test and compare students of different methods books that are using the same approach (for example students taught with Leila Fletcher compared with students taught with Pianokids). Is the presentation and content of one method book better at creating reliable reading skills over another? It would also be worthwhile to investigate the sight reading skills of mixed intervallic students further. Are the skills in this area developing as the students progress through the method? Do their sight reading abilities stay on par or surpass the middle C approach?

The teaching of music reading skills is often the primary focus of piano lessons for many young beginner students, yet it is an area severely lacking in scientific research. As can be seen from this study and those previous, there are many unanswered questions regarding music reading on many levels. Further study into reading approaches would greatly benefit teachers and students. It would provide confidence to teachers that the utilized approach would generate reliable reading skills and would make the process of learning to read music effective and successful for young piano students.

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APPENDIX 1

Handedness identification

The following four questions are asked – every participant needs to demonstrate the action – not say left or right)

Show me which hands you use to do the following activities Write R (for right), L (for left) or E (for either):	
Writing / drawing	L R E
Throwing a ball	L R E
Using scissors	L R E
Using a toothbrush	L R E

Options: using a racket? Using a hockey stick?

APPENDIX 2

Protocol for Note Recognition

Equipment Checklist

- Video camera
- Tripod
- Piano keyboard
- Computer (laptop) with sequence/pattern recognition program loaded
 - This will contain 4 subtests
 - a. Naming Notes (Keyboard Presentation)
 - 10 stimuli
 - b. Naming Notes (Staff Presentation)
 - 20 stimuli
 - c. Playing notes (middle C Position)
 - 10 stimuli
 - d. Playing notes (middle G Position)
 - 10 stimuli
- Laptop with mouse
- Log sheet for tracking response accuracy
- 2 colored stickers
 - Red on middle C
 - Blue on the G above middle C

Protocol

Naming Condition Keyboard

1. Place video camera to the right of the participant. Turn on video camera.
2. Have participant show ID to camera.
3. Write down participant's ID, time, etc in logbook.
4. Sit participant at piano. Stand to the left of the participant to not block camera.
5. Give a brief explanation of the first condition saying: "*You are going to see a piano come up on the screen and a red dot will land on the note. As soon as you know the name of the note, tell me. After you tell me, the next one will appear until the video ends. Do you understand?*"
6. Press the "p" key, to begin the program and expose the first stimuli. The remainder of the stimuli will continue to appear automatically. Keep note of the participant's responses on your log sheet.

Naming Condition Staff

1. *Good work. This time, instead of a piano, notes will be shown on the spaces and lines of the treble clef. Do you know where the treble clef is on the piano?*
If no, explain and demonstrate that it is everything higher than middle C. If yes, continue.

2. *Just like before, I want you to try your best to tell me the name of the note. If you know the answer, tell me quick before the next one appears. If you really don't know, you can tell me that you don't know. And that's OK. Do you understand?*
3. Press the "p" key, to begin the program and expose the first stimuli. The remainder of the stimuli will continue to appear automatically. Keep note of the participant's responses on your log sheet.

Playing Condition-C Position

1. *This time, we are going to play notes instead of naming them. Can I get you to put your RH thumb on the red sticker? If the participant has any trouble finding the proper hand position, give some assistance. The right thumb should be on middle C*
2. *After participant places thumb on middle C, Now spread your fingers so there is one finger on every note.*
3. *This time, as soon as you see the note, try to play that note on the piano as soon as it appears on the screen. The notes won't go past where your fingers are. Do you understand what to do?*
7. *Say: "Great, now can you spread out your fingers so that each finger has its own key? Alright, now more notes are going to appear on the screen. Can you play them for me as soon as you see them appear? Are you ready?"*
8. Press the "p" key, to begin the program and expose the first stimuli. The remainder of the stimuli will continue to appear automatically. Keep note of the participant's responses on your log sheet.

Playing Condition-G Position

1. *This time, we are going to play notes instead of naming them. Can I get you to put your RH thumb on the blue sticker? If the participant has any trouble finding the proper hand position, give some assistance. The right thumb should be on the G above middle C.*
2. *After participant places thumb on G, Now spread your fingers so there is one finger on every note.*
3. *This time, as soon as you see the note, try to play that note on the piano as soon as it appears on the screen. The notes won't go past where your fingers are. Do you understand what to do?*
4. *Say: "Great, now can you spread out your fingers so that each finger has its own key? Alright, now more notes are going to appear on the screen. Can you play them for me as soon as you see them appear? Are you ready?"*
5. Press the "p" key, to begin the program and expose the first stimuli. The remainder of the stimuli will continue to appear automatically. Keep note of the participant's responses on your log sheet.

APPENDIX 3

Protocol for Pattern Recognition

Equipment Checklist

- Video camera
- Tripod
- Piano keyboard
- Computer (laptop) with sequence/pattern recognition program loaded
 - This will contain 16 stimuli
 - 4 chordal stimuli named aloud
 - 2 patterns
 - 2 aleatory
 - 4 melodic stimuli named aloud
 - 2 patterns
 - 2 aleatory
 - 4 chordal stimuli played
 - 2 patterns
 - 2 aleatory
 - 4 melodic stimuli played
 - 2 patterns
 - 2 aleatory
- Mouse
- Log sheet for tracking response accuracy
- 2 colored stickers
 - Red on middle C
 - Blue on the G above middle C

Protocol

Naming Condition:

1. Place video camera to the left of the participant. Turn on video camera.
2. Have participant show number to video camera.
3. Sit participant at piano. Stand to the right of the participant to not block camera.
4. Give a brief explanation of the first condition saying: *“You are going to see a few notes come up on the screen. As soon as you see them can you read them out to me in the order you would play them in? Are you ready to try it out?”*
5. Press the “1” key to begin the program and expose the first stimuli. The remainder of the stimuli will continue to appear automatically. Keep note of the participant’s responses on your log sheet.
6. Repeat the procedure for the presentation of notes on staff as well.

Playing Condition

7. Give a brief explanation of the next condition saying: *“Now we are going to do something very similar to last time, but this time you are going to play the notes on the piano instead. Could I get you to put your right hand thumb on the red dot?”*
8. If the participant has any trouble finding the proper hand position, give some assistance. The right thumb should be on middle C
9. Say: *“Great, now can you spread out your fingers so that each finger has its own key? Alright, now more notes are going to appear on the screen. Can you play them for me as soon as you see them appear? Are you ready?”*
10. Press the “1” key to begin the program and expose the first stimuli. The remainder of the stimuli will continue to appear automatically. Keep note of the participant’s responses on your log sheet.
11. There will now be a hand position change. *“Okay, now we are going to change where your hand is. Can you put your right thumb on the blue dot? Have the participant put their right hand thumb on the blue dot:”* If the participant has any trouble finding the proper hand position, give some assistance.
12. Say: *“Great, now can you spread out your fingers so that each finger has its own key? Alright, more notes are going to appear on the screen, can you play them for me as soon as you see them appear? Are you ready?”*
13. Press the “1” key, to begin the program and expose the first stimuli. The remainder of the stimuli will continue to appear automatically. Keep note of the participant’s responses on your log sheet.

End of experiment

APPENDIX 4

Protocol for Rehearsed Reading

Equipment Checklist

- Video camera
- Tripod
- MIDI Piano keyboard
- MIDI interface
- Stand for music
- Sight reading material (B1, B2)
- Guide with finger position
- Clipboard
- Logbook

Protocol

1. Place video camera to the right of the participant. Turn on video camera.
2. Have participant show ID tag to the video camera.
3. Sit participant at piano. Stand to the left of the participant to not block camera.
4. Give a brief explanation of the first condition saying: *“When you are ready, I am going to show you a piece of music on the screen. I want you to play it for me as best as you can. As soon you see the music, start playing right away. Do you understand what to do?”*
5. Refer to the guide to see what the starting position for the first piece is and have child place that finger on the correct key.
6. *“Can you show me your (12345th) finger? Great, now can you spread out your fingers so that each finger is on its own key? Are you ready try it out?”*
7. Pull up the appropriate piece of music. Hit CTL+L for full screen. HIT CTRL+ 5 times to zoom in. Let the participant play to the end.
8. *Good job. I want to let you practice the piece. Play it from beginning to end (point across the music from left to right). We will do this three time. Let’s start!*
9. After 3rd practice: *Now that the practice is done, let’s try playing performing it again. Can you play this piece for me the best that you can?”*
10. If the participant played through the first piece without much difficulty, proceed to the next using the same protocol as specified above. If the participant struggled with the piece, end the testing session.

End of experiment

Rehearsed Sight Reading Pieces B-1 and B-2

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APPENDIX 5

Protocol for Sight Playing

Equipment Checklist

- Video camera
- Tripod
- MIDI Piano keyboard
- MIDI interface
- Music stand
- Sight reading material (A1)
- Guide with finger position
- Clipboard
- Logbook

Protocol

1. Place video camera to the right of the participant. Turn on video camera.
2. Have participant show ID to the camera.
3. Sit participant at piano. Stand to the left of the participant to not block camera.
4. Give a brief explanation of the first condition saying: *“When you are ready, I am going to show you a piece of music on the screen. I want you to play it for me as best as you can. As soon you see the music, start playing right away. Do you understand what to do?”*
5. Refer to the guide to see what the starting position for the first piece is and have child place that finger on the correct key.
6. *“Can you show me your (12345th) finger? Great. Now, can you also spread out your fingers so that each finger is on its own key? Are you ready try it out?”*
7. Pull up the appropriate piece. Hit CTL+L for full screen. HIT CTRL+ 5 times to zoom in. and let the participant play to the end.
8. Repeat the process for the next two (B1,B2) sight reading pieces. If the participant is making many mistakes and struggling, do not have them continue past their current piece. Move onto the next test.

End of experiment

Sight Reading Piece A-1

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APPENDIX 6

Piano Pedagogy Lab Reading Scale for Piano

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