A COMPARISON OF METHODS FOR SIGHT-READING DEVELOPMENT UTILIZING COLLEGIATE SAXOPHONISTS

Scott Campbell, B.M., M.M.

Dissertation Prepared for the Degree of

DOCTOR OF MUSICAL ARTS

UNIVERSITY OF NORTH TEXAS

May 2016

APPROVED:

Dr. Debbie Rohwer, Major Professor
Dr. Eric Nestler, Co-Major Professor
Prof. Brad Leali, Committee Member
Dr. Benjamin Brand, Director of Graduate Studies in the College of Music
Dr. Henry Warren, Interim Dean of the College of Music
Costas Tsatsoulis, Dean of the Toulouse Graduate School
The ability to sight-read well is held as a highly regarded and important skill in music performance and education. Over the past 90 years, researchers have investigated several aspects of music sight-reading, especially those attributes possessed by skilled sight-readers. A significant and recurrent finding from this body of research is the relationship between sight-reading and rhythm recognition. Though these studies have found positive effects and correlations between rhythm recognition and sight-reading, they have been limited and indirect. The aim of this dissertation was to investigate the effects of (a) practicing rhythms on a single pitch and (b) practicing rhythms with full-range scales and their direct effects on sight-reading ability in saxophonists at the college level. The primary objective in this research was to determine if one method was more effective than another in developing sight-reading skills. The participants \( N = 74 \) consisted of college students who were enrolled in saxophone lessons at a university in the southwestern United States. Participants were administered a sight-reading pre-test at the beginning of an 8-week treatment period. After pre-testing, students were blocked into two groups. The first treatment group was assigned to practice rhythms on a single pitch and the second treatment group was assigned to practice rhythms combined with full-range major scales. After the treatment period, participants were administered a sight-reading post-test. A 2-way mixed ANOVA was used to determine if there were differences between treatment groups, differences from pre-test to post-test, and if there was a significant interaction between treatment and time. There was no significant difference between treatment groups, \( F (1, 72) = .035, p = .852 \), partial \( \eta^2 = .00028 \). There was a significant effect for time, indicating that both treatment
groups improved from pre-to post test, \( F(1, 72) = 83.499, p < .001 \), partial \( \eta^2 = .537 \). There was no significant interaction between treatment and time, \( F(1, 72) = .322, p = .572 \), partial \( \eta^2 = .004 \).
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ACKNOWLEDGEMENTS

I wish to thank many individuals for their help and support in bringing this project to completion. First, I am indebted to my wife, Melissa. Her steadfast support through this entire degree has been a strength to me. I continue to look up to her. I also wish to thank my children, Sydney and Spencer, for their patience and sacrifice while I spent countless hours away working on this degree and research project.

This project could not have been undertaken without the assistance and support of my degree committee. Dr. Debbie Rohwer’s tremendous guidance and tireless effort deserves anything good which comes from this project whereas I assume responsibility for its shortcomings. I wish to thank Dr. Eric Nestler who has served as my major professor throughout this degree. I could not have asked for a better mentor. His influence in my life is invaluable. He has been kind and supportive in every way possible. Professor Brad Leali was a catalyst for this study. His intuition as a teacher and support in this project is greatly appreciated.

I wish to thank those who were involved in this study, including the students, instructors, and those who gave of their time and talents to help bring this project to completion. Thank you very much. Lastly, I wish to thank my parents who taught their sons the importance of hard, diligent work and that with it, one may achieve their goals.
TABLE OF CONTENTS

ACKNOWLEDGEMENTS ........................................................................................................... iii

Chapters

1. INTRODUCTION ......................................................................................................................... 1
   State of Research ...................................................................................................................... 2
   Statement of the Problem ......................................................................................................... 4
   Purpose of the Study ................................................................................................................ 4
   Significance of the Study .......................................................................................................... 5
   Research Design ........................................................................................................................ 5
   Limitations of Study .................................................................................................................. 9
   Delimitations of Study .............................................................................................................. 10

2. REVIEW OF LITERATURE ........................................................................................................ 11
   Introduction ............................................................................................................................... 11
   Common Traits of Sight-Reading Ability ................................................................................ 11
   Sight-Reading and Eye-Hand Span .......................................................................................... 14
   Sight-Reading and Rhythm Recognition ................................................................................ 16
   Summary .................................................................................................................................... 19

3. METHODOLOGY ..................................................................................................................... 20
   Introduction ............................................................................................................................... 20
   Design ....................................................................................................................................... 20
   Sample ....................................................................................................................................... 21
   Measurement Instrument ......................................................................................................... 22
   Equipment .................................................................................................................................. 26
   Reliability and Validity ............................................................................................................ 28
   Threats to Internal Validity ....................................................................................................... 29
   Procedures for Measurement Instrument Administration .................................................. 30
   Scoring and Judging of the Measurement Instrument .......................................................... 32
Procedures for Treatment and Comparison Groups ........................................32

4. RESULTS ..............................................................................................................36
   Introduction .................................................................................................36
   Presentation of Results ..............................................................................37

5. CONCLUSION .....................................................................................................39
   Summary ........................................................................................................39
   Discussion ......................................................................................................40
   Recommendations .....................................................................................42

APPENDICES ........................................................................................................44

REFERENCES .....................................................................................................59
CHAPTER ONE

INTRODUCTION

The ability to sight-read well has been cited as a required and highly regarded skill in music performance and education (Farley, 2014). Its necessity is frequently called upon to be used in rehearsal settings, performance situations, and auditions. For such an important skill, limited emphasis is often placed upon sight-reading in higher education in comparison to other aspects of musicianship. As traditional music programs in the United States are commonly based upon the European conservatory approach to music education, a high emphasis is usually placed upon performance, in particular solo performance. The majority of time and attention is often given to the development of tone, technique, phrasing, and musicality. Sanders (1986) indicated that often the emphasis to perform well in solo performances is so great, that it causes teachers to disregard other aspects of musical achievement such as sight-reading. Beyond this, musicians may be able to perform at an extremely high level without heavily relying on their sight-reading ability. An example of this may be seen in the following:

A dyslexic musician who was the holder of a demanding position as a music adviser [recounted] that he achieved his Licentiate of the Royal Academy of Music on the piano because he was awarded such high marks on his performance of his rehearsed pieces - which he performed from memory - that his failure on the sight-reading section was relatively immaterial. (Oglethorpe, 2002, p. 97)

In a study by Hardy, 221 MTNA certified teachers were surveyed. From this, it was found that 13 percent ranked the skill of sight-reading as most important, 73 percent as highly important, 14 percent as fairly important, and zero percent as somewhat important or not
significant. Despite their views of sight-reading being an important aspect of musicianship, only seven percent indicated they taught sight-reading in a systematic manner. This example indicates the contradiction between the value musicians and educators put upon sight-reading and the time and attention that is given to it.

Nevertheless and notwithstanding the limitations in addressing the skill of sight-reading at the instructional level, high demands are still expected within and without the walls of academia. Thankfully, through music education research, more productive and effective approaches and methods in developing music sight-reading are being discovered in a way that can benefit music instructors in the pedagogy of sight-reading.

State of Research

The first study on sight-reading was conducted in 1924 by Dr. Earl Hillbrand (Mishram, 2013). Since 1924, over 700 studies have been conducted that have included sight-reading (Mishram, 2013). Several significant studies have been made that have found key indicators possessed by those with sight-reading fluency. Beyond the scope of music, research has also discovered the benefits music sight-reading has on general cognitive abilities. (Bugos & Mostafa, 2011).

Many researchers have investigated the relationships and indicators of sight-reading. Hayward and Gromko (2009) observed that aural discrimination, spacial-temporal reasoning, and technical proficiency combined were positive indicators of sight-reading proficiency. Meinz and Hambrick’s (2010) study of pianists discovered a strong relationship between sight-reading and time spent in regular personal practice, specifically sight-reading practice and years in private lessons. Moreover, they noted that working memory capacity (akin to short term memory)
positively influenced sight-reading to a small degree. Both Luce (1965) and McPherson, Baily, and Sinclair (1997) found a strong correlation between sight-reading and playing by ear with high school students due to both tasks involving a combination of auditory and kinesthetic skills. Yet Anderson (1981) found that recorded aural examples did not improve 6th- and 7th-grade woodwind players' sight-reading ability.

Research that has focused on skilled sight-readers has shown the importance of reading ahead while sight-reading music. Furneaux and Land (1999) as well as Truitt, Clifton, Pollatsek, and Rayner (1997) found that the eye-hand span (i.e., the distance one reads ahead while sight-reading) was greater in pianists who were better at sight-reading. Streckfuss (1983) created a machine that progressively covered the music notation as it was being sight-read, thus forcing the musician to look ahead and increase their eye-hand span. He found that by using this machine, university music students improved their sight-reading competency.

Research on university students by Elliot (1984) and high school students by Gromko (2004) found that the greater competency exhibited by a student in regard to rhythmic recognition, the more successful the sight-reading results. Thomson (1953) found that more than half of sight-reading errors made by participants were the result of rhythmic errors, indicating the strong relationship between rhythm recognition and sight-reading. Van Nuys and Weaver (1943) documented a positive relationship between rhythm recognition and sight-reading. Additionally, Byo (1992) compared the effects of reading rhythms on a single note to reading rhythms with a melody in a study of university students. He found that students’ rhythmic sight-reading ability was not inhibited by the addition of pitch, which indicates that rhythm may have a greater effect
on sight-reading than pitch. Based on his findings, Byo recommended that more research in the area of rhythm study, especially at the college level, be conducted.

**Statement of the Problem**

From the research cited above, one attribute appears most predictive of positive sight-reading ability: rhythm recognition. Though research has been conducted on sight-reading and rhythmic recognition, it has been indirect and limited. Further, much of the research on sight-reading has been conducted with pianists or secondary school level participants. Little research on sight-reading has been published using students of wind instruments at the college level.

While studies have documented important indicators of sight-reading competency, research needs to be conducted to compare methods of sight-reading development. Though studies have shown that recognizing and reading rhythms are key predictors of increased skills at sight-reading, there is insufficient information regarding the most effective ways to study rhythms.

**Purpose of the Study**

As proposed previously by Byo (1992), more research in the area of rhythm study, especially at the college level is needed. One popular and widely used method for studying rhythms with a wind instrument is practicing rhythms on a single pitch. This logical and common teaching technique is seen in many band method books to practice rhythms (Lautzenheiser, 2000; Rush, Moon, & Wilder, 2011; Sheldon, 2010; Smith, Smith, Story, Markham, & Crain, 2006) and has been documented as effective in a study conducted by Boyle (1970). An alternative to studying rhythms on a single pitch was identified by the author and has been found in use by a university professor (Leali, 2014), a fine arts department within an independent school district.
(Howell, personal communication, 2014), and two method books (Ayola, 1985; Bellson, 1968), all with informally-documented favorable results. This method has students practice rhythms while utilizing scales simultaneously. Beginning music students commonly study scales and rhythm exercises separately to develop music performance competency. This method combines the two. The purpose of the proposed study is to determine the effect of studying rhythms from Louis Bellson’s *Modern Reading Text in 4/4: Syncopation Studies Designed to Develop Accuracy and Speed in SightReading* (a) using a single pitch and (b) using full range scales.

**Significance of the Study**

By determining if both methods are equally or unequally effective in the development of sight-reading, educators may make more informed decisions as to how they instruct students in sight-reading and rhythm comprehension. Further, this study may be beneficial to the professional musician and student to make informed decisions as to how to develop their own sight-reading ability. Beyond this, the experiment may document the effectiveness of studying rhythms on sight-reading ability in a manner and design that has not been done previously.

**Research Design**

The participants in the study consisted of college saxophone students at a large university in the southwest region of the United States. This university was chosen because of the convenience in location as well as the large population of saxophone students. The major requirement for participation in the study was enrollment in private lesson instruction. The sample was surveyed and asked demographic questions that related to the study. This consisted of (a) the average amount of years practicing saxophone, (b) participation in middle school and
high school band programs and participation in music classes in elementary school; and, (c) the study of another instrument before starting saxophone.

Many studies have used the Watkins-Farnum Performance Scale (WFPS) to measure sight-reading ability (Elliot, 1982; Gromko, 2004; Haley, 1998; Hayward & Gromko, 2009, Luce, 1965; Space, 2003; Streckfuss 1984; Watkins & Farnum, 1970). However, the WFPS was not designed to be used with college level music students (Lillya & Britton, 1954). For this reason, participants were individually tested using a measurement instrument specifically designed for this study. The measurement instrument, which followed the design of the WFPS, consisted of a pre- and a post-test. Each test was composed of three exercises that gradually increased in difficulty. The measurement instrument was tested and re-tested for validity and reliability prior to the study. The exercises found in the pre-test and post-test were found to be equivalent in difficulty so as to be equitable for measurement purposes. Institutional review board approval was obtained before any data were gathered from participants involved in pilot testing.

The pre-test portion of the measurement instrument was administered at the beginning of an 8-week treatment period and the post-test was administered at the end. The participants were individually administered the tests in a single, large studio room. They were instructed to start at the beginning of each of the three exercises and play to the end. They were allowed 30 seconds at the beginning of each exercise to look over the music without playing anything on their saxophone. The score for each exercise was a percentage based on the amount of notes executed correctly compared to notes performed incorrectly or not at all. The three percentages from the
exercises were added together to create the scores for the pre-test and the post-test. The possible scores for the pre- and post-tests ranged from 0 to 300.

Similar to the WFPS, “the test is meant to be scored as it is administered” (Boyle, 1992, p. 260). Therefore, the researcher administered the test, who was a doctoral candidate in saxophone performance. The tests were scored as they were performed by SmartMusic® assessment software. SmartMusic® has been documented for its reliability and accuracy and has been considered the standard in music education assessment software (Karas, 2005; Lee, 2007; Long, 2011).

After the pre-test data were gathered, participants were assigned to one of two treatments. Both treatment groups were assigned Modern Reading Text in 4/4 for All Instruments: Syncopation Studies Designed to Develop Accuracy and Speed in Sight-Reading by Bellson (1985). As previously stated, rhythm recognition has been documented as a positive indicator of sight-reading ability. Music educators have also tended to agree that the study of rhythm is an effective approach to sight-reading improvement (Boris, 1996). Bellson’s book was chosen for this study because of its wide use and prominence among musicians and educators (Bellson, 2015). This method book, which consists of sequentially based rhythm exercises, is divided into 17 chapters. Each chapter is made of exercises that highlight a specific rhythmic pattern. Patterns are written on a single pitch (bass clef E).

Students in treatment group one were taught how to utilize this book by playing rhythms on the written pitch of C2. Students in treatment group two were taught how to utilize this rhythm book by playing full-range major scales using the entire range of the saxophone, beginning with the tonic of a scale and changing to the next pitch as each rhythmic note changes.
Given that the single note treatment would allow for exercises to be completed more quickly than the full range scale treatment, a time-based assignment structure was established. Otherwise, the full range scale treatment group would require more time to master each exercise, thus creating inequitable conditions across the two groups. The groups were assigned to study from *Modern Reading Text in 4/4 for All Instruments: Syncopation Studies Designed to Develop Accuracy and Speed in Sight-Reading* for 10 minutes a day, 5 days a week, for the duration of the study (8 weeks) in their private practice using the method that was assigned to them. Each participant was asked to log their rhythm practice times on an online practice record. This information was electronically recorded and sent directly to the researcher. Additionally, in each private lesson, the instructor chose selections from the week's practice material and asked the student to perform it.

Both treatment groups (students who practiced rhythms on a single note and those who employed full range scales) were taught by the saxophone instructors in their respective studios, which were located in the college. Students were informed that both treatments had been found effective in the development of sight-reading and that this study was being conducted to see if the learning techniques were equally effective or if one was more effective than the other with
university-level students. All participants were informed and instructed that during the duration of the study they could not practice using the other group’s treatment material.

For the current study, a 2-way, mixed ANOVA was used with the dependent variable being sight-reading scores. The independent variables were treatment (between-subject variable with levels being single pitch and full-range scale method groups) and time (within-subject variable with levels being pre-test and post-test). An interaction between treatment and time was also calculated to determine if any qualifications needed to be made to main effect findings.

Limitation of Study

As mentioned previously, the Watkins-Farnum Performance Scale has been used often to measure sight-reading and has become an industry standard in the measurement of sight-reading improvement. The WFPS is limited in its measuring ability in that it cannot reliably measure tone quality, vibrato, musicality, and idiomatic phrasing or interpretation. In fact, there is no measurement tool at this time that can allow researchers to measure a combination of musicality, phrasing, tone, dynamics, articulation and intonation simultaneously in a sight-reading test with any sense of reliability or objectivity. Of course, musicians would consider all of these aspects as necessary components of sight-reading. However, the researcher was only able to measure the correct pitch at the correct time for the current study.

By using SmartMusic® software as a measurement tool, pitch and rhythm can be assessed in sight-reading performances. The opportunity to utilize SmartMusic® in sight-reading evaluation has allowed for a more objective, reliable, and valid approach to measurement than has been possible with human judges (Karas, 2005).
Delimitations of Study

The results of this study should not be generalized beyond the current body of participants. While the large participant number was comprised of graduate and undergraduate students as well as majors that included performance, jazz, music education, composition, and non-music majors, these participants were not sampled from a larger group of individuals to whom generalizations can be made. It is possible, though, that this initial project may benefit the profession due to a greater understanding of practice techniques and sight-reading.
CHAPTER TWO

REVIEW OF LITERATURE

Introduction

Many studies have been conducted that have investigated sight-reading. These studies have investigated why musicians sight-read at varying abilities as well as what methods may be most effective at developing sight-reading. The studies presented in this chapter can be grouped into the following three categories; (a) research that has sought to find common traits in musicians who possess a high level of sight-reading ability, (b) eye-hand span as a commonly found trait among high-level sight-readers, and (c) the relationship between reading rhythms and sight-reading.

Common Traits of Sight-Reading Ability

Several studies have investigated common traits in musicians who possess a high level of sight-reading ability. The majority of research found in this section of the literature review consists of ex post facto designs. In many of these studies participants’ sight-reading ability was tested then surveyed or tested for abilities and previous experience that may have positively impacted sight-reading. The researchers then analyzed the data to find trends of previous experience or skills in those with fluent sight-reading ability.

Hayward and Gromko (2009) analyzed previous research results and hypothesized that three main indicators could predict positive sight-reading ability. In their study, 70 participants from a medium-sized midwest university were tested, all of which were from wind ensembles. Following testing and analysis, the researchers observed that aural discrimination, spacial-
temporal reasoning, and technical proficiency combined were indicators of positive sight-reading skill.

Like Hayward and Gromko (2009), Meinz and Hambrick (2010) investigated possible sight-reading predictors. In particular, they were interested in a growing body of research that examined the positive effects of deliberate practice in the realms of sports and music. In this study, they investigated the relationship between diligent practice and sight-reading ability. In addition to this, other possible sight-reading predictors were analyzed. For this study, pianists ($N = 57$) with a broad spectrum of abilities were surveyed and tested. Their findings indicated a strong relationship between sight-reading and time spent in regular personal practice, specifically sight-reading practice and years in private lessons. Moreover, they noted that working memory capacity (akin to short term memory) positively influenced sight-reading to a small degree.

Luce (1965) documented that the abilities to sight-read and play-by-ear were considered important components to good musicianship. In this study, Luce investigated the relationship between sight-reading and playing-by-ear skills as well as characteristics that may contribute to the development of these skills. The participants consisted of high school band and orchestra students. The researcher found a strong, positive correlation between sight-reading and playing-by-ear. It was found that characteristics and activities such as mental age, status of leadership, intelligence quotient, time spent in instrumental rehearsal and, as in Meinz and Hambrick's (2010) study, private lessons all had a strong, positive relationship to sight-reading and playing-by-ear. In addition to his findings, Luce noted that although music educators generally agreed that the skills of sight-reading and playing-by-ear were important, this was not reflected in the
amount of time or attention given to the skills in the classroom. Additionally, when these skills were addressed, it was done so with a plethora of approaches and methods.

McPherson, Baily, and Sinclair (1997) conducted a study in Sydney, Australia that involved 101 high school instrumentalists. The researchers examined five aspects of musical performance: (a) performance of rehearsed music, (b) sight-reading, (c) performing from memory, (d) playing-by-ear, and (e) improvising. In addition, they investigated 16 factors that may influence these aspects of musical performance. They discovered that sight-reading had a significant effect on participants’ abilities to rehearse and prepare a piece for a performance situation. In addition, as in Luce's (1965) study, these researchers discovered a strong correlation between sight-reading and playing-by-ear because both tasks involved a combination of using auditory and kinesthetic skills.

In a meta-analysis of sight-reading studies, Mishra (2013) found the treatments that fall within the categories of “Aural Training, Collaboration, Controlled Reading, Creative Activities, Instrumental Training, Interval Drill, Movement, Notation, Rhythmic Drill, and Singing/Solfege” were all effective in improving sight-reading ability (p. 142). The study also found that generally, both treatment and control groups improved from pre- to post-tests. These findings support previously mentioned studies that have indicated aural training and skill as having a positive effect on sight-reading ability (Hayward & Gromko 2009; Luce, 1965; McPherson, Baily, & Sinclair, 1997).

However, an experimental study by Anderson (1981) did not support the positive relationship between aural skills and sight-reading. Anderson’s research investigated the effect of recorded music examples in personal practice on sight-reading performance. This study involved
80 sixth-grade clarinet students in Austin, Texas. In this Pre-test Post-test Control-Group Design, students in the treatment group utilized tape-recorded aural models in their home practice, while the control group practiced only with the sheet music. It was believed that the influence of the aural models would have a positive effect on students’ ability to sight-read, however the results indicated that there was no significant difference between the two groups.

**Sight-Reading and Eye-Hand Span**

Across the studies that have investigated sight-reading, one indicator has been documented as a key predictor of sight-reading performance: the musician's ability to read ahead, referred to as eye-hand span (EHS). The following research has shown the importance of reading ahead while sight-reading music.

Furneaux and Land (1999) conducted a sight-reading study that involved professional and amateur pianists in England. In this study, researchers used two different types of measurements to calculate eye-hand span (EHS). The first of these measurements was note index. Note index refers to how many notes the eye is ahead of the hands. The second type of measurement was time index. Time index refers to the amount of time that passes between when an eye fixation occurs and when that information is executed by the hand(s). The researchers found that professional and amateur pianists had eye fixation periods that were the same length of time. These fixation periods were either lengthened or shortened depending on the tempo of the music when sight-reading. However, professionals tended to look at and/or process more notes during these fixation periods. This indicates that advanced sight-readers may possess a larger EHS than less skilled sight-readers.
In another study that investigated eye-hand span (EHS) and sight-reading music with pianists, Truitt, Clifton, Pollatsek, and Rayner (1997) measured eye fixation periods and perceptual window. In so doing, the researchers were able to measure how long it took the eyes to gather data and how much data the eyes gathered per eye fixation. The researchers then measured the EHS in relation to the fixation periods and perceptual window. They found that highly skilled sight-readers had shorter fixation periods and larger perceptual windows than less-skilled sight-readers. This indicates that advanced sight-readers may be able to gather more information in a shorter amount of time. The musicians were also able to process and execute information faster, meaning they had a larger EHS than the less skilled sight-readers. It should be noted that their findings, which indicated highly skilled sight-readers had shorter fixation periods, contradicts the findings of Furneaux and Land (1999) that professional and amateur pianists had eye fixation periods that were the same length of time. However Truitt, Clifton, Pollatsek, and Rayner's (1997) finding that highly skilled sight-readers had larger perceptual windows than less-skilled sight-readers agrees with Furneaux and Land (1999).

An experimental study on EHS and sight-reading was conducted by Streckfuss (1983) who created a machine that progressively covered music notation as it was being sight-read, thus forcing the musician to look ahead and increase their EHS. In his study, the effects of his machine were measured on sight-reading improvement using college wind band musicians ($N = 56$). Using a Pre-test Post-test Control-Group Design, the participants were pretested using the Watkins-Farnum Performance Scale. Each group was given specific sight-reading exercises to practice over a 6-week period. In addition to the sight-reading exercises, the treatment group practiced with Streckfuss’ pacer machine. At the end of the 6-week period, all participants were
post-tested. Streckfuss found that by using the pacer machine, university music students improved their sight-reading competency and increased their eye-hand span. Notably, those in the treatment group improved their sight-reading ability in only 6 weeks for what the WFPS indicates should have taken 2 years.

Van Nuys and Weaver (1943) investigated ocular movements when musicians read rhythm, melody, and harmony. In this study, equipment was used to record and measure eye movement while the participants sight-read rhythmic, melodic, harmonic examples or combinations of the three. For this study 12 men who were collegiate piano students were recruited as participants. The findings of this experiment give additional insight to the aforementioned finding of Furneaux and Land (1999) who documented that eye fixations were longer or shorter based on the tempo of music being sight-read. In addition to tempo, Van Nuys and Weaver (1943) also found that eye fixations or pauses were longer when sight-reading rhythms rather than melodies. This indicated that processing time for rhythm may be longer than that for melody (pitch). It was also discovered that an improved ability to comprehend rhythmic patterns increased sight-reading speed. The improvement of rhythm recognition was also found to be more effective at developing sight-reading speed than an increased ability to recognize pitch or melody.

**Sight-Reading and Rhythm Recognition**

The ability to recognize and process rhythms quickly has been documented as having a positive effect on one's eye-hand span. By instantly recognizing rhythms the student can process the information more quickly and look ahead in the music. The importance and positive influence of rhythm reading and its effect on sight-reading ability have been cited by several
researchers (Boyle, 1970, Elliot, 1984; Gromko, 2004; Van Nuys & Weaver, 1943; Thomson, 1953).

In a study of collegiate musicians, Elliot (1984) investigated the correlation between seven variables and general sight-reading ability. These variables included (a) technical proficiency, (b) rhythm reading, (c) sight-singing, (d) grade point average, (e) music theory grade point average, (f) performance jury scores, and (g) major instrument grade point average. This study used college-level wind instrumentalists ($N = 32$). It was found that the single greatest indicator of sight-reading ability was the capacity to read rhythms. This research indicates that the study of rhythms, specifically at the college level, may be important when developing sight-reading ability.

In a study of high school wind band students conducted in midwest public high schools, Gromko (2004) also investigated four cognitive skills and their relationship to music sight-reading. These variables included, (a) music sight-reading and tonal and rhythmic audiation, (b) visual field articulation, (c) spatial orientation and visualization, and (d) achievement in math concepts and reading comprehension. From this study the researcher found that rhythmic audiation, the mental activity when sound is not present, was influential in sight-reading ability. Further, it substantiated previous studies (Hayward & Gromko, 2009; Luce, 1965; Meinz & Hambrick, 2010) that found that multiple cognitive abilities were used when sight-reading music and that effective sight-readers were skilled at processing patterns of music rather than processing a single note at a time. This research indicates that the study of rhythms, even at the high school level, may be important when developing sight-reading ability.
In a study of violinists and clarinetists, Thomson (1953) discovered that more than half of all sight-reading errors made by his participants were rhythmic. This finding supports the idea that there may be a relationship between rhythm recognition and sight-reading ability as documented in other studies (Boyle, 1970; Gromko, 2004; Van Nuys & Weaver, 1943). From these findings the researcher advised that in order to improve sight-reading skill, greater emphasis could be placed on the study of rhythm.

In another study with significant findings of rhythm and sight-reading by Boyle (1970), junior high school bands practiced rhythms 30 minutes a week. A control group practiced playing rhythms on a single pitch with a strong emphasis to not use bodily movements, especially that of tapping their feet to the beat and clapping their hands to the rhythm. A second, experimental group also practiced on a single pitch but added the use of tapping of feet and clapping of hands as a central component to their 30 minutes of practicing rhythms each week. The findings of the study showed that both groups significantly improved their sight-reading skill. However, the experimental group improved significantly more than the control group. While Boyle noted that many studies have shown that the study of rhythm may benefit music performance, he stated that “many music educators fail… to undertake the systematic teaching of [rhythm]” (Boyle, 1970, p. 308).

Byo (1992) examined the influence of selected components of musical notation on sight-reading ability. The participants in this study were undergraduate and graduate music majors who were studying at a large university in the southern United States. As part of the study, students sight-read rhythms on a single pitch as well as rhythms and pitches combined. The results of this study surprised the researcher who found that students sight-read both examples with similar
ability, meaning that the inclusion of pitch did not hinder or help the sight-reading ability of the participants. This substantiates previous studies (Van Nuys & Weaver, 1943; Thomson, 1953) that have documented that the element of rhythm may have a greater impact on sight-reading than pitch. From this finding it was also acknowledged that more research in the area of studying rhythm, especially at the college level, should be conducted.

Summary

In summary, many studies have been conducted that have investigated sight-reading. From these studies researchers have found many attributes that can positively affect sight-reading ability. Among these influences, rhythm recognition has been found to be one of the strongest predictors of sight-reading performance. However, little research has been conducted that only addresses rhythm and sight-reading. Further, little research has been completed at the college level to discover the most effective ways in improving sight-reading when practicing rhythms.
CHAPTER THREE

METHODOLOGY

Introduction

The following chapter describes the design of this study and the variables used. In addition, the sample is described, including how participants were chosen, the groups into which they were assigned, and the location at which the study took place. The measurement instrument is explained and described in detail. The chapter also addresses the reason the instrument was chosen for this study. The equipment used in this study is detailed with brand and settings for context, and also includes the equipment placement, when important to the study. Reliability and validity are documented along with internal validity. The procedures that were used for the administration of the measurement instrument are detailed for application. These procedures include who administered the measurement, where and when it was administered, the duration time of each test, and the instructions that were given to the participants. Procedures for scoring the measurement instrument responses are detailed for replication. Lastly, the procedures for treatments of both treatment groups are described in equal detail, including what material was used, how long the treatment lasted, and the instructions given.

Design

For this study a Pre-test Post-test Control Group Design was used. A Pre-test Post-test Control Group Design is an experimental design in which the researcher pre-tests all of the participants. After pre-testing the researcher assigned participants to either treatment group one or treatment group two. The Pre-test Post-test Control Group Design is an effective design because the two groups experience the same conditions other than the independent variable; in
the case of this study the independent variable for treatment group one was practicing rhythms on a single pitch and the independent variable for treatment group two was practicing with full-range scales. After the independent variables had been administered to the treatment groups, both groups were given a post-test. By doing this, the researcher was able to measure the effects of the independent variable on the dependent variable.

This design was chosen because of its effectiveness in comparing participant groups and its ability to measure the difference in the amount of progress each group has made from the beginning of the study to after the implementation of the independent variable on the dependent variable. Another reason this design was chosen is because of its common use in similar studies.

Sample

The sample (N = 74) consisted of college students who were enrolled in saxophone lessons at a university located in the southwestern United States. This school was chosen for the study because of the large population of saxophone students and convenience in location. There were two requirements for participation in the study. The first was that the participants had to be 18 years or older. The second was that the participants had to be enrolled in applied saxophone private lessons.

A questionnaire regarding background information, as it pertained to the study, was utilized to describe the participants (see Appendix D). The first question regarded age. Students could choose one of three categories. The first category was ages 18 to 25 years old, (n = 68, where n is the number of students). The second category was ages 26 to 35 years old (n = 5) and the third was 36 years or older (n = 1).
The second question was created to discover participants’ university music experience. From this question students could choose one of four categories that best described them. The first category was undergraduate non-music major \((n = 3)\), the second category was undergraduate music major \((n = 60)\), the third was master’s level music major \((n = 6)\), and the fourth was doctoral level music major \((n = 5)\).

Question three asked how many years each participant had performed/studied the saxophone. Six categorical selections were listed from which the participants could select one. The first was 1 to 4 years \((n = 2)\). The second category was 5 to 8 years \((n = 32)\). The third category was 9 to 12 years \((n = 33)\). The fourth category was 13 to 20 years \((n = 6)\). The final category was 21 or more years \((n = 1)\).

The fourth question pertained to experience in elementary school music programs. For this question students could select either yes \((n = 43)\) or no \((n = 31)\). The fifth question inquired whether the participants had participated in a middle school band program. Students could select either yes \((n = 69)\) or no \((n = 5)\). The sixth question inquired whether the participants had performed in a high school band program. Students could again select either yes \((n = 71)\) or no \((n = 3)\). The seventh and final demographic question was designed to determine whether participants had studied an instrument previous to the saxophone. Students were able to select either yes \((n = 33)\) or no \((n = 41)\).

**Measurement Instrument**

Previous studies have used the Watkins-Farnum Performance Scale (WFPS) to measure sight-reading ability (Elliot, 1982; Gromko, 2004, Haley, 1998; Hayward & Gromko, 2009, Luce, 1965, Space, 2003; Streckfuss, 1984; Watkins & Farnum, 1970). Though most of these
studies consisted of secondary school-aged music students, one of these investigations was comprised of university students (Streckfuss, 1984). Despite this, the WFPS was designed to be tested on beginning through advanced high school students (Lillya & Britton, 1954). After examining the WFPS in consideration of the general expected sight-reading level of the participants in this study, it was believed that the WFPS would not suffice in difficulty for the population at the selected university. For this reason, participants were individually tested using a measurement instrument that was specifically designed for this study. This is not an anomaly as past studies have used sight-reading measurement instruments other than the WFPS (Karas, 2005; Lee, 2007). The scale used in the current study followed the design of the WFPS in that it consisted of a pre-test and a post-test. The pre- and post-tests were written so as to be equitable in difficulty for measurement purposes.

Each test consisted of three exercises or levels. The exercises in each of the tests were designed so as to increase in difficulty with each exercise due to the rhythmic and pitch content found therein. The pre- and post-tests were based off of reviewed literature and treatment material. Exercises were not transposed for each member of the saxophone family. Rather, students testing on alto, tenor, and baritone saxophones used the same test.

The first exercises of the pre- and post-tests were 16 measures in length. Rhythms for these exercises were extracted from pp. 4–11 of Louis Bellson’s *Modern Reading Text in 4/4 for All Instruments: Syncopation Studies Designed to Develop Accuracy and Speed in Sight-Reading*. Pitches for these exercises were derived from number 6 of Ferling’s *48 Famous Studies*. Both exercises were composed in the written pitch of G major and contained three measures with accidentals. Exercise one of the pre-test had a range of G1 to C3. Exercise one of
the post-test had a range of F#1 to D3. The rhythms of pre-test exercise one consisted of a dotted half note, a half note rest, quarter notes and quarter rests, and eighth notes and eighth rests. Post-test exercise one rhythms consisted of a half note, quarter notes and quarter rests, and eighth notes and eighth rests. Both exercises included the use of ties on the quarter and eighth note levels; however, despite the use of ties, each downbeat and subdivision of the measure was clearly delineated. Pre- and post-test exercise one examples had a tempo indication of quarter note equals 108BPM.

Exercise two of the pre- and post-tests were 20 measures in length. Pitches for these exercises were derived from *Relaxing with Lee* in the *Charlie Parker Omnibook*. Rhythms for these exercises came from pp. 14–23 of *Modern Reading Text in 4/4 for All Instruments: Syncopation Studies Designed to Develop Accuracy and Speed in Sight-Reading*. Both exercise examples had a key signature of written Bb major. Pre-test exercise two contained 15 measures with accidental(s). Post-test exercise two contained 10 measures which included accidental(s). Pre-test exercise two had a range of F1 to Eb3. Post-test exercise two had a range of F1 to F3. The rhythms of pre-test exercise two consisted of a dotted half note, a half note, quarter notes and quarter rests, and eight notes and eighth rests. Post-test exercise two consisted of a half note, a dotted quarter note, quarter notes and quarter rests, and eighth notes and eighth rests. Both exercise examples included the use of ties on the quarter and eighth note levels and are characterized with more syncopation on the eighth note level. Additionally, downbeats and subdivision of the measure were less clearly delineated than pre- and post-test exercise one
examples. Less conventional rhythmic notation was utilized.\textsuperscript{1} Such unconventionalities occur from the use of abnormal beaming. Examples include that which does not make the quarter note beat obvious, the first note of a beamed set falling on an off beat, or the beaming is such that it hides the importance of where the third beat lies within the measure (see Appendix C for pre-test and post-test exercise examples). Both exercise two examples of the pre- and post-tests had a tempo indication of quarter note equals 120BPM.

Exercise three of pre- and post-tests were 20 measures long and had a key signature of written C major. Rhythms for these exercises were collected from pp. 34-43 from \textit{Modern Reading Text in 4/4 for All Instruments: Syncopation Studies Designed to Develop Accuracy and Speed in Sight-Reading} and pitches were extracted from \textit{Blue Bird} of the \textit{Charlie Parker} Omnibook. Both exercise examples contained 15 measures with accidental(s) and had a range of D1 to C3. The rhythms of pre-test exercise three consisted of quarter notes and quarter rests, eighth notes and eighth rests, and sixteenth notes and sixteenth rests. Post-test exercise three rhythms consisted of a dotted half note, quarter notes and quarter rests, eighth notes and eighth rests, and sixteenth notes and sixteenth rests. Both exercise examples included the use of ties on the eighth and sixteenth note levels. These tests were highly syncopated on the eighth and sixteenth note levels. Downbeats and subdivision of the measure were not clearly identifiable. Even more than in exercise example two, less conventional rhythmic notation and beaming was utilized. Both exercise three examples had a tempo indication of quarter note equals 112BPM.

\textsuperscript{1} These less-conventional rhythmic notations were purposefully employed due to their use in Louis Bellson’s \textit{Modern Reading Text in 4/4 for All Instruments: Syncopation Studies Designed to Develop Accuracy and Speed in Sight-Reading} (Bellson, 1985), which was used by both treatment groups in studying rhythms.
**Equipment**

*SmartMusic®* is an interactive music learning subscription based software. It is designed to be used with standard instrumentation for concert band, jazz band, full orchestra, and voice. *SmartMusic®* contains a database of tens of thousands of pieces for use in practice and testing situations. Categories include concert and jazz ensembles, string and full orchestra, choir, sight-reading for instruments and voice, jazz improvisation, method books, exercises, and solos.

Musicians may download any work from the *SmartMusic®* repertoire database to their home computer or tablet. Beyond the *SmartMusic®* library, custom *SmartMusic®* files may be created by first creating the sheet music in *Finale®* and then exporting it as a *SmartMusic®* file.

When a title has been selected, students may open the *SmartMusic®* file and indicate which instrument from the score they would like the music to be presented. Once a file is opened in *SmartMusic®* several tools are available to the user. Though there are many functions and tools, only those that pertain to this study will be discussed.

First, the sheet music for the selected instrument is displayed in the center of the screen. The user can change from regular screen to full screen to maximize screen space. They may change to another instrument by clicking on the instrument tab. This changes the displayed sheet music to the newly selected instrument’s part of the score. Or, if it is a solo piece, *SmartMusic®* transposes the music to the appropriately written key.

If a student wishes, he or she may perform with an accompanying audio file or a metronome. Both features allow the user to slow down the tempo to 40BPM or speed the tempo up to 280BPM. By doing this, the pitch of the accompaniment will not be affected. If a custom *SmartMusic®* file is being used, as was the case in this study, the user has the option of
performing with or without the metronome. The metronome has several options. It can accent the downbeat of each measure and play either the beat or the beat and its subdivisions. In addition, there are several count-off options. Count-off options include a one-bar count off, two-bar count off, or a voice count off that is executed by a computer-generated voice.

The *SmartMusic®* location tool allows the user to start or end at any measure and beat of the piece. In addition, the location tool allows the musician or teacher to loop a selected portion of the music. The tracks tool is an effective tool *SmartMusic®* offers to its users. This tool has the option of having *SmartMusic®* play the written part, the accompaniment, or both with the user. Most importantly, the tool has the option of assessment.

*SmartMusic®* has the ability to assess performance. This is possible when a microphone is connected to the computer. This interface allows *SmartMusic®* to assess the performance of the user. When the assessment option is selected, *SmartMusic®* will display red, green, or black note heads on the sheet music portion of the screen at the end of the performance. Green note heads indicate that the pitch and rhythm of the note were correct. Red note heads indicate that the rhythm, pitch, or both were incorrect. The program will then place the incorrect red note heads on the score in the pitch/rhythmic location in which it was performed. Black note heads indicate that the user performed no pitch. In addition, the *SmartMusic®* assessment tool provides an assessment percentage grade based on the number of correct notes versus the number of incorrect notes and notes not performed. Further, each assessment may be saved as a recorded audio sample. The assessment results and recording may be emailed from a student to a teacher. Lastly, a tuner is provided that visually depicts the user’s pitch or play back the pitch to which the user’s pitch is closest in order to match by ear.
The microphone used in connection with SmartMusic® was the Snowball professional USB microphone by Blue Microphones®. This microphone was placed on a microphone stand and attached to the computer by means of a USB cable. This microphone has three settings for its pattern. The first is cardioid, the second is cardioid with a -10db pad, and the third has an omni pattern. The second setting was used in this study. It was thought that the built-in computer speaker system would not be loud enough for the saxophonists to hear the metronome clearly. For this reason, the iLoud by IK Media® was employed. The iLoud is a 40-watt active monitor. This monitor was connected to the computer by a double male 3.5mm auxiliary cable. The cable was plugged into the input connection in the back of the iLoud and then plugged into the headphone jack of the computer. This study used a 2.5GHz Apple MacBook with 4GB of memory to run SmartMusic®, SPSS, and Numbers for Mac.

Reliability and Validity

After institutional review board approval had been obtained (see Appendix A), the sight-reading exercises, which comprised the pre- and post-tests, were tested and retested for reliability. Five saxophonists at the college, who were not enrolled in lessons and not participants in this study, were tested and assessed on all six sight-reading examples. The similarity of their scores indicated that the pre- and post-tests were equivalent in difficulty so as to be equitable for measurement purposes.

The sight-reading tests were assessed and scored by SmartMusic® as they were performed. SmartMusic® has been documented for its reliability, validity, and accuracy and is considered the standard in music education assessment software. In a study that tested the assessment accuracy of SmartMusic®, Long (2011) concluded that SmartMusic® was objective
and accurate in the evaluation and assessment of rhythm and pitch. In another study by Karas (2005), four judges were used to verify the reliability and validity of the *SmartMusic®* performance assessment tool. The *SmartMusic®* assessment tool and inter-judge reliability were found to be consistent. From this, the *SmartMusic®* performance assessment tool was deemed valid and reliable. In another study where the *SmartMusic®* performance assessment tool was employed as a performance evaluation tool, Lee (2007) used the Cronbach alpha coefficient to determine the tool’s internal consistency reliability. Due to this high correlation, the *SmartMusic®* performance assessment tool was found to be reliable. After a series of student performances, a highly correlated composite of judges’ scores was used to compare with the *SmartMusic®* performance assessment tool. This resulted in a high correlation of 0.912. From this correlation, the *SmartMusic®* performance assessment tool was found to be a valid measurement tool (Lee, 2007, p. 56).

**Threats to Internal Validity**

A Pre-test Post-Test Control Group design was utilized to control for threats to validity such as history, testing, instrumentation, and regression. To prevent the threat of selection and maturation to internal validity, participants were blocked into two groups, ensuring equal ability to both groups. Of the 76 participants who took the pre-test, two participants were lost from the study. One was from treatment group one, the other from treatment group two. Because of this, no extreme threat of mortality was presented to the internal validity. By giving both groups a treatment between pre- and post-tests, testing was eliminated as a threat to internal validity.
Procedures for Measurement Instrument Administration

To begin this study, the researcher met and corresponded through email with collegiate faculty at the southwest college. Both professors were supportive of this comparison project being conducted with all saxophone students enrolled in lessons. They believed that students assigned to either group would benefit from the study and gave consent and support. Following approval from the department faculty, a proposal of the research topic was submitted to the college’s Graduate Performance Degree Committee. After approval from this committee was obtained, an application for permission for this study was submitted and approved by the college’s institutional review board. After approval was received a pilot test was run to determine the reliability and validity of the sight-reading tests, SmartMusic® settings, and placement of the audio monitor and microphone.

Prior to this study, the researcher had experience using the SmartMusic® assessment tool and the hardware associated with it in various music education settings. From this experience, it was learned that the microphone and powered monitor placement needed to be specifically positioned to function properly while simultaneously not inhibiting the accuracy of the SmartMusic® assessment tool. More specifically, if the powered monitor was placed too close to the microphone, the microphone was positioned too far from the saxophone, or the volume input was set to high, the sound of the metronome would be picked up and adversely affect the scoring of the SmartMusic® assessment tool. Moreover, if the volume of the metronome was too quiet or the position of the powered monitor too distant, the participants’ ability to hear the beat would be inhibited and thus skew the accuracy of the results. The preconceived placements of the
equipment, to avoid the aforementioned concerns, were tested during the pilot study and found to work effectively.

After the pilot test, the main study was conducted. Parts A and B of the measurement tool were administered by the researcher, who is a saxophone performance doctoral candidate. The administrations were carried out in a single, large studio office which was approximately 20 feet long and 15 feet wide. In the office there was a piano, desk, music stand, and acoustical wall treatments on three of the four walls. At the desk was a chair where the researcher was positioned. The computer running SmartMusic® and the iLoud powered monitor were positioned on the desk. The music stand and microphone were placed approximately 6 feet away from the desk. This allowed enough distance between the microphone and the powered monitor amplifying the metronome click so as to be clearly heard by the saxophonists but not picked up by the microphone. Also, in order to facilitate the microphone accurately picking up the saxophone and not picking up the metronome, the microphone was placed approximately 6 to 8 inches away from the bell of the saxophone. The input volume slider was set at 4/5ths or 80% volume. The location distances between the monitor, microphone and saxophone worked for the assessment tool of SmartMusic® to score the performances of the saxophonists without bleed in from the metronome, which would have adversely affected the assessment.

At the beginning of an 8-week treatment period, the pre-test was administered to all participants. Pre-testing took place over the course of 2 consecutive days toward the beginning of the Fall 2015 semester. Students were instructed to sign up for one 10-minute time slot between 8AM and 5PM. The pre-testing took approximately 10 minutes for each student to complete.
The post-test was administered at the end of an 8-week treatment period, at the end of the Fall 2015 semester. Like the pre-testing, the post-testing took place over the course of 2 consecutive days. Students were again instructed to sign up for a 10-minute time slot between 8 AM and 5 PM. The post-testing took approximately 10 minutes for each student to complete.

Students entered one at a time and stood at the music stand where the tests were presented to them in the form of sheet music. They were allowed to take a moment to warm up if they had not previously done so. They were informed that the pre- and post-tests would consist of three sight-reading tests, with each subsequent test increasing in difficulty. The participants were instructed to perform the sight-reading tests with the metronome. The metronome was set to include an accent on the down beat of each measure. They would receive 30 seconds to look over each sight-reading test before they performed it. At the end of the 30 seconds they would be given four clicks by the metronome as a count off to begin the tests. Before the 30-second study time, the researcher informed the participants of the tempo of each sight-reading test.

**Scoring and Judging of the Measurement Instrument**

The scoring of each test was executed by the SmartMusic® assessment tool. At the end of each performance SmartMusic® provided a percentage based on the number of correct pitches versus the number of pitches that were played incorrectly or not played at all. The three percentages from the exercises were added together to create the scores for the pre-test and the post-test. The possible scores for the pre- and post-tests ranged from 0 to 300.

**Procedures for Treatment and Comparison Groups**

After the pre-test was administered, participants were blocked into one of two treatments. Both treatment groups were assigned *Modern Reading Text in 4/4 for All Instruments:*
Syncopation Studies Designed to Develop Accuracy and Speed in Sight-Reading by Bellson (1985). As previously stated, rhythm recognition has been documented as a positive indicator of sight-reading ability. Music educators have also tended to agree that the study of rhythm is an effective approach to sight-reading improvement (Boris, 1996). Bellson’s book was chosen for this study because of its wide use and prominence among musicians and educators (Bellson, 2015). This method book, which consists of sequentially-based rhythm exercises was divided into 17 chapters. Each chapter was made of exercises that highlight a specific rhythmic pattern. Patterns were written on a single pitch (bass clef E).

Students in treatment group one were taught how to utilize this book by playing rhythm exercises on the single pitch of C2. Students in treatment group two were taught how to utilize this rhythm book by playing full-range major scales using the entire range of the saxophone, beginning with the tonic of a scale and changing to the next pitch as each rhythmic note changed. See example below:

Because the single note treatment would allow for exercises to be completed more quickly than the full range scale treatment, a time-based assignment structure was established. Otherwise, the full range scale treatment group would require more time to master each exercise thus creating inequitable conditions between the two groups. The groups were assigned to study from Modern Reading Text in 4/4 for All Instruments: Syncopation Studies Designed to Develop...
Accuracy and Speed in Sight-Reading 10 minutes a day, 5 days a week, for the duration of the study (8 weeks) in their private practice using the method which was assigned to them. They were instructed to repeat the exercises if their assignment was completed before the end of the prescribed practice period. The assignment schedule for both groups is listed below.

<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Pages</th>
<th>BPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>08/04-08/10</td>
<td>4-7</td>
<td>108-132</td>
</tr>
<tr>
<td>Week 2</td>
<td>08/11-08/17</td>
<td>9-12</td>
<td>108-132</td>
</tr>
<tr>
<td>Week 3</td>
<td>08/18-08/24</td>
<td>13-15</td>
<td>108-132</td>
</tr>
<tr>
<td>Week 4</td>
<td>08/25-08/31</td>
<td>16-19</td>
<td>108-132</td>
</tr>
<tr>
<td>Week 5</td>
<td>11/01-11/07</td>
<td>22-25</td>
<td>108-132</td>
</tr>
<tr>
<td>Week 6</td>
<td>11/08-11/14</td>
<td>26-29</td>
<td>108-132</td>
</tr>
<tr>
<td>Week 8</td>
<td>11/22-11/27</td>
<td>36-38</td>
<td>108-132</td>
</tr>
</tbody>
</table>

Example: The key indicated for full range scales refers to the alto, tenor, and baritone saxophone’s written pitch, not concert pitch. The indicated key was only for the group using scales as the other group only used middle C.

In addition to the weekly assignment schedule, each participant was asked to log their rhythm practice times on an online practice record (see Appendix B). Out of the 74 participants, 47 turned in online practice records, 22 of these were from treatment group one and 25 were from treatment group two. The total number of recorded minutes practiced by all students was 12,204 (203 hours). The total number of recorded minutes practiced by treatment group one was 5,381 (89 hours) and the total number of recorded minutes practiced by treatment group two was 5,840 (97 hours). It should be noted that the amount of practice is an additional extraneous variable in this study’s results.

Both treatment groups were taught by the saxophone instructors in their respective studios, which are located in the college of music. At the beginning of each private lesson the saxophone instructors followed up with each student by selecting one to three lines from each page of the week’s assignment and asked the student to perform the lines in the lesson. Students were informed that their preparation on these assignments would be taken into consideration for
their weekly lesson grade. The goal tempos for these assignments were from 108–132BM. However, it was emphasized to teachers and students that accuracy was more important than speed.

At the beginning of this study, students were informed that both treatments had been found effective in the development of sight-reading, but that the current study was being conducted to see if the treatments were equally effective or if one was more effective than the other at the university level. Furthermore, teachers were instructed to refrain from expressing their opinions in regard to one treatment being more effective than the other. Rather, if asked by a student, they referred to what had been stated regarding the effectiveness of both treatments at the beginning of the study.
CHAPTER FOUR

RESULTS

Introduction

The aim of this study was to compare techniques that could help musicians increase their
sight-reading ability. In so doing, the investigator wished to discover which of two treatments
had a greater impact at improving sight-reading ability. Accordingly, sight-reading performance
was the dependent variable. The within subjects-factor consisted of the scores from pre- to post-
test and the between subjects-factor consisted of the two experimental groups, treatment group
one and treatment group two. Treatment group one practiced rhythms on a single pitch whereas
treatment group two practiced rhythms using full range scales. College saxophonists \( N = 74 \)
participated in this experiment. From the 74 participants 37 were blocked into treatment group
one (practicing rhythms on a single pitch) and 37 were blocked into treatment group two
(practicing rhythms with full-range scales). This blocking was completed by putting the sight-
reading pre-test scores in high to low order for scores and placing one high-scoring participant
into each group, progressing down to the lowest scoring participants, thereby equating the scores
for the two groups. Both treatments lasted for an 8-week period. At the end of the 8-week period
the sight-reading ability of both groups was measured by a post-test.
Presentation of Results

Using SPSS\(^2\), a 2-way, mixed ANOVA\(^3\) was chosen to determine if there were differences between treatment groups (single pitch and full-range scale method groups) and between time (within-subject variable with levels being pre-test and post-test). The ANOVA also documented whether there was a significant interaction between the treatment and time. The results were:

The overall range of scores for both treatment groups on the pre-test was 23 to 278. For treatment group one the range of scores on the pre-test was 34 to 278. For treatment group two the range of score on the pre-test was 23 to 274. The overall range of scores for both treatment groups on the post-test was 63 to 293. For treatment group one the range of scores on the post-test was 111 to 288. For treatment group two, the range of scores in the post-test was 63 to 293.

There was no statistically significant main effect between treatment group one and treatment group two \(F(1, 72) = .035, p = .852, \text{ partial } \eta^2 = .000028\). Treatment group one (single pitch rhythm practice) had a mean score of 223.514 (\(SD = 45.182\)), treatment group two (full-range scale rhythm practice) had a mean score of 223.027 (\(SD = 48.343\)).

There was a significant main effect for time, showing a statistically significant difference in sight-reading ability from the pre- to the post-test across all participants, \(F(1, 72) = 83.499, p < .001, \text{ partial } \eta^2 = .537\). The pre-test mean score for participants at the beginning of the study was 195.635 (\(SD = 57.105\)) and after the treatment, the post-test mean score for participants was 223.270 (\(SD = 46.469\)).

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\(^2\) SPSS (Statistical Analysis in Social Science) is a software program used for statistical analysis.

\(^3\) ANOVA, which is an abbreviation for Analysis of Variance, is a method used in statistics in which the means of different groups are analyzed to find variations or differences between the groups or other factors.
There was no statistically significant interaction between the treatment and time on sight-reading ability, $F(1, 72) = .322$, $p = .572$, partial $\eta^2 = .004$. 
CHAPTER FIVE
SUMMARY, DISCUSSION, AND RECOMMENDATIONS

Summary

The aim of this study was to determine whether practicing rhythms on a single pitch or practicing rhythms combined with full range scales were strategies that were equally effective or not in the development of sight-reading ability at the college level. A Pre-test Post-test Control Group Design was used for this study. The participants in the study consisted of college-level saxophone students. These participants were administered a sight-reading pre-test at the beginning of an 8-week period. After the administration of the pre-test, students were blocked into two equitable groups. Both groups were assigned to practice out of Modern Reading Text in 4/4 for All Instruments: Syncopation Studies Designed to Develop Accuracy and Speed in Sight-Reading by Louis Bellson (1985).

The first group was assigned to practice rhythms using a single pitch (written C2). The second group practiced rhythms while utilizing full-range scales. Each group practiced rhythms with their assigned treatment method for 10 minutes a day, 5 days a week, for an 8-week period. In addition, each participant’s private lesson instructor followed up by having the participant play examples from the week’s rhythm assignment. At the end of the treatment period participants were administered a post-test. Pre- and post-tests were evaluated and found to be of equitable difficulty for accurate measurement purposes. Each test was assessed and scored as it was performed by SmartMusic® software, which has been documented as reliable and accurate in assessment and is considered the standard in music education assessment software.
A 2-way, mixed ANOVA was employed for statistical processing of data using SPSS. From this, it was found that the main effect for the between subjects factor of treatment was not significant, meaning that participants increased their sight-reading skills regardless of treatment group. Further, it was discovered that the main effect for the within-subjects factor of time was significant. Meaning, there was a significant improvement in sight-reading ability by both groups from pre-test to post-test. This indicates that the practice of rhythm contributed to the improvement of sight-reading ability. Lastly, there was no significant interaction between time and treatment.

**Discussion**

*Effects of Treatment*

There was no significant difference between the two groups’ sight-reading improvement. This implies that the specific method used for developing sight-reading ability may be less pertinent. What this may imply is that a better match of practice technique to each student’s ability may have achieved different results. The reasons for this outcome can be many. One in particular is worth mentioning. It was noted by instructors that some of the participants placed in treatment group two struggled with the ability to practice rhythms combined with full range scales. In these instances it was felt that the students may have benefited more from practicing rhythms on a single pitch or even by counting and clapping the rhythm as these exercises appeared more appropriate for their skill level. Further, it was found that some students had trouble deciphering rhythms completely. In this case, time may have been needed to be spent on teaching basic rhythmic principles. Conversely, there were students placed in treatment groups one and two who easily prepared each week’s assignment in the time allotted. For these students,
practicing rhythms on middle C or with full range scales may not have been significantly challenging. In both of these cases the exercises and treatments assigned to the students may have either been too easy or too hard for their skill level. When choosing a method for practicing rhythms, the student’s experience and ability should be taken into consideration. In addition, a sequentially-based approach to learning rhythms may be desirable as students’ rhythm recognition skills can vary.

**Effects of Time**

There was a significant change (or increase) in participants sight-reading from the beginning of the study to the end indicating that both treatment groups significantly benefited from their practice. This finding evidences that the practice of rhythms was effective in the development of sight reading ability. The treatment period for this study was 8 weeks. Participants were instructed to practice rhythms 5 days a week for 10 minutes a day. Over the 8 week treatment period, students would have practiced rhythms an accumulative 400 minutes (6 hours 40 minutes) per participant. The effects of time suggest that the more time spent on practicing rhythms, the more the ability to sight-read may be improved. This also may indicate that the longer the treatment period, the more one’s sight-reading may improve. These results give evidence of the importance and positive influence rhythm reading had on sight-reading improvement and is in agreement with previous studies (Boyle, 1970, Elliot, 1984; Gromko, 2004; Van Nuys & Weaver, 1943; Thomson, 1953). At the college level, it may be pertinent that music educators devote time and attention to the study and practice of rhythms. By doing this they may better assist their students in the development of sight-reading ability, which can consequently and positively influence their music-making experience and future career.
Interaction of Treatment and Time

The interaction between treatments and time was not significant. Overall, students increased from the beginning to the end of the study regardless of the technique they used. The participants increased their sight-reading skill with both treatments. Again, this demonstrates that the amount of time spent practicing rhythms may have been more telling than the specific method used, at least in regard to the methods used in this study.

Recommendations

1. Whereas the literature has indicated the responsibility of sight-reading development of students be placed upon band and ensemble directors at the middle and high school levels, this may not present itself as appropriate or practical at the university level. Instead, the responsibility for developing sight-reading skills may need to be placed with the applied lessons teacher. Applied lesson teachers may wish to incorporate not only the weekly practice of rhythms into their curriculum but also incorporate sight-reading examinations into semester performance examinations, if this is not already being done.

2. As eye-hand span and rhythm recognition have been recognized as positive indicators of sight-reading ability, further research should be conducted to find correlations between these two components of the reading of music notation.

3. Many online resources exist for the purpose of developing sight-reading ability. One of these, sightreadingfactory.com, creates rhythm and sight-reading exercises based on criteria and difficulty selected by the user. In addition, it features a “disappearing measures” option that functions similarly to Streckfuss’s pacer machine. The pacer machine is not currently available for use or purchase. Further research needs to be conducted to investigate if the
feature of “disappearing measures” has the same effect on sight-reading as Streckfuss’s pacer machine.

4. Though studies have indirectly found that rhythm affects the speed of eye-hand span, more so than pitch, research should be conducted that directly investigates the effects of rhythm reading on eye-hand span.

5. In this study, some instructors indicated that there were students in treatment group one who found practicing rhythms on a single pitch too easy, thus not presenting a challenge. Conversely, there were students in treatment group two who found practicing scales over rhythms too difficult and perhaps would have been better served by practicing rhythms on a single pitch. For this reason, the development of a sequentially-based system for rhythm reading, which can properly benefit musicians of all levels – beginner through professional – may need to be developed.

6. It was found when performing eighth notes in a heavily swung fashion, the SmartMusic® assessment tool would occasionally cause notes to be marked as incorrect. This is an implication for further research and may present challenges to those who may choose to use SmartMusic® to assess swung rhythms. It would be beneficial for future research if SmartMusic® included an option to accurately assess swung eighth notes.
APPENDIX A

IRB APPROVAL
September 11, 2015

Supervising Investigator: Dr. Debbie Rohwer
Student Investigator: Scott Campbell
Department of Music Education
University of North Texas

Re: Human Subjects Application No. 15363

Dear Dr. Rohwer:

As permitted by federal law and regulations governing the use of human subjects in research projects (45 CFR 46), the UNT Institutional Review Board has reviewed your proposed project titled "A Comparison of Methods for Sight-Reading Development Utilizing Collegiate Saxophonists." The risks inherent in this research are minimal, and the potential benefits to the subject outweigh those risks. The submitted protocol is hereby approved for the use of human subjects in this study. Federal Policy 45 CFR 46.109(e) stipulates that IRB approval is for one year only, September 11, 2015 to September 10, 2016.

Enclosed is the consent document with stamped IRB approval. Please copy and use this form only for your study subjects.

It is your responsibility according to U.S. Department of Health and Human Services regulations to submit annual and terminal progress reports to the IRB for this project. The IRB must also review this project prior to any modifications. If continuing review is not granted before September 10, 2016, IRB approval of this research expires on that date.

Please contact Shelie Bourns, Research Compliance Analyst at extension 4643 if you wish to make changes or need additional information.

Sincerely,

Chad R. Trulson, Ph.D.
Professor
Department of Criminal Justice
Chair, Institutional Review Board

CT/sb
University of North Texas Institutional Review Board
Informed Consent Form

Before agreeing to participate in this research study, it is important that you read and understand the following explanation of the purpose, benefits and risks of the study and how it will be conducted.

**Title of Study:** A Comparison of Methods for Sight-Reading Developments Utilizing Collegiate Saxophonist

**Student Investigator:** Scott Campbell, University of North Texas (UNT) Department of Music. **Supervising Investigator:** Dr. Debbie Rohwer.

**Purpose of the Study:** The aim of this study is to determine whether practicing rhythms on a single pitch or practicing rhythms combined with full range scales is more effective in the development of sight reading ability at the college level.

**Study Procedures:** The researcher will gather data before and after this naturally embedded practice in order to measure which is more effective. To accomplish this, the researcher will use a Pretest Posttest Control Group Design. Subjects will be blocked into one of the two groups after the pretest in order to equate scores. The baseline group will study rhythms on a single pitch while the variable group will study rhythms while utilizing the full range of the instrument. After 11 weeks the posttest data will be gathered and analyzed to measure any difference between methods in developing sight reading. Pre and post tests will be scored as they are performed by SmartMusic® assessment software which is considered the standard in music education assessment software. The audio recordings and test results created by SmartMusic® will be saved for evaluation by the researcher.

**Foreseeable Risks:** No foreseeable risks are involved with this study, as the practice techniques and pretest and posttest performance scenario are a normal part of any musical environment.

**Benefits to the Subjects or Others:** The project may benefit the profession due to a greater understanding of the impact of practice techniques on sight reading. All students may benefit to some extent from practicing techniques that could improve their sight reading.

**Procedures for Maintaining Confidentiality of Research Records:** Participants’ confidentiality and anonymity will be kept by the use of a coded survey and test results. The list with the codes will be kept in a separate locked file cabinet than the data or the consent forms. All data and consent forms will be kept and maintained for 3 years in a locked cabinet located in the College of Music. These data will be kept separate from any identifying information. The confidentiality of participant’s individual information will be maintained in any publication or presentation regarding this study.

**Questions about the Study:** If you have any questions about the study, you may contact Scott Campbell by email at scottcampbell@my.unt.edu and by phone at (541) 218-4123. You may also contact Dr. Debbie Rohwer by email at Debbie.Rohwer@unt.edu and by phone at (940) 369-7538.
Review for the Protection of Participants: This research study has been reviewed and approved by the UNT Institutional Review Board (IRB). The UNT IRB can be contacted at (940) 565-4643 with any questions regarding the rights of research subjects.

Research Participants' Rights: Your signature below indicates that you have read or have had read to you all of the above and that you confirm all of the following:

- Scott Campbell has explained the study to you and answered all of your questions. You have been told the possible benefits and the potential risks and/or discomforts of the study.
- You understand that you do not have to take part in this study, and your refusal to participate or your decision to withdraw will involve no penalty or loss of rights or benefits. The study personnel may choose to stop your participation at any time.
- Your decision whether to participate or to withdraw from the study will have no effect on your grade or standing in your courses.
- You understand why the study is being conducted and how it will be performed.
- You understand your rights as a research participant and you voluntarily consent to participate in this study.
- You have been told you will receive a copy of this form.

__________________________
Printed Name of Participant

__________________________
Signature of Participant

__________________________
Date

For the Student Investigator: I certify that I have reviewed the contents of this form with the subject signing above. I have explained the possible benefits and the potential risks and/or discomforts of the study. It is my opinion that the participant understood the explanation.

__________________________
Signature of Student Investigator

__________________________
Date

APPROVED BY THE UNT IRB
FROM 9/1/15 TO 9/1/16

Office of Research Integrity & Compliance
University of North Texas
Last Updated: July 11, 2011
APPENDIX B

SAMPLE PRACTICE LOG
# Practice Log for Sydney Campbell

Showing Entries From 8/13/2015 to 8/20/2015 [Change]

<table>
<thead>
<tr>
<th></th>
<th>Date</th>
<th>Minutes</th>
<th>Notes</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="Image" alt="Edit" /></td>
<td>Mon, Aug 17, 2015</td>
<td>10</td>
<td>Bellson Book, pp. 4...</td>
<td></td>
</tr>
<tr>
<td><img src="Image" alt="Edit" /></td>
<td>Tue, Aug 18, 2015</td>
<td>10</td>
<td>Bellson Book, swung....</td>
<td></td>
</tr>
<tr>
<td><img src="Image" alt="Edit" /></td>
<td>Wed, Aug 19, 2015</td>
<td>10</td>
<td>Bellson Book @ 120bpm...</td>
<td></td>
</tr>
<tr>
<td><img src="Image" alt="Edit" /></td>
<td>Thu, Aug 20, 2015</td>
<td>10</td>
<td>Bellson, @160bpm</td>
<td></td>
</tr>
</tbody>
</table>

Total minutes practiced: 40 minutes
Total days practiced: 4 days/week
Average minutes practiced per session: 10 minutes
Average minutes practiced per day: 5 minutes
Average minutes practiced per day (when practiced): 10 minutes
APPENDIX C

PRE- AND POST-TEST EXERCISES
Pre-test Exercise 1

\begin{music}
\begin{musicStaff}
\set clef=treble
\set keySignature=4\sharp
\set timeSignature=4/4
\set tempo=108

\bar{1}
\rpeg{\rtri{3}}\rpeg{\rtri{2}}\rpeg{\rtri{1}}\rpeg{\rtri{2}}\rpeg{\rtri{3}}\rpeg{\rtri{4}}\rpeg{\rtri{5}}\rpeg{\rtri{6}}\rpeg{\rtri{7}}\rpeg{\rtri{8}}\rpeg{\rtri{9}}\rpeg{\rtri{10}}\rpeg{\rtri{11}}\rpeg{\rtri{12}}
\bar{2}
\rpeg{\rtri{3}}\rpeg{\rtri{2}}\rpeg{\rtri{1}}\rpeg{\rtri{2}}\rpeg{\rtri{3}}\rpeg{\rtri{4}}\rpeg{\rtri{5}}\rpeg{\rtri{6}}\rpeg{\rtri{7}}\rpeg{\rtri{8}}\rpeg{\rtri{9}}\rpeg{\rtri{10}}\rpeg{\rtri{11}}\rpeg{\rtri{12}}
\bar{3}
\rpeg{\rtri{3}}\rpeg{\rtri{2}}\rpeg{\rtri{1}}\rpeg{\rtri{2}}\rpeg{\rtri{3}}\rpeg{\rtri{4}}\rpeg{\rtri{5}}\rpeg{\rtri{6}}\rpeg{\rtri{7}}\rpeg{\rtri{8}}\rpeg{\rtri{9}}\rpeg{\rtri{10}}\rpeg{\rtri{11}}\rpeg{\rtri{12}}
\bar{4}
\rpeg{\rtri{3}}\rpeg{\rtri{2}}\rpeg{\rtri{1}}\rpeg{\rtri{2}}\rpeg{\rtri{3}}\rpeg{\rtri{4}}\rpeg{\rtri{5}}\rpeg{\rtri{6}}\rpeg{\rtri{7}}\rpeg{\rtri{8}}\rpeg{\rtri{9}}\rpeg{\rtri{10}}\rpeg{\rtri{11}}\rpeg{\rtri{12}}
\end{musicStaff}
\end{music}
Pre-test Exercise 2

Saxophone
Pre-test Exercise 3
Post-test Exercise 1

Saxophone

\[ \text{\textbf{\textit{Exercise 1\footnote{Music notation}}} \]
Post-test Exercise 2

Saxophone
Post-test Exercise 3
APPENDIX D

DESCRIPTIVE SURVEY
Which of the following categories includes your age?
☐ 18-25
☐ 26-35
☐ 36 or older

Which of the following categories are you included?
☐ Undergraduate Non-music major
☐ Undergraduate Music Student
☐ Master’s Graduate Music Student
☐ Doctoral Graduate Music Student

How many years have you performed or practiced the saxophone?
☐ 1-4
☐ 5-8
☐ 9-12
☐ 13-20
☐ 21 or more

Did you participate in an elementary school music program?
☐ Yes
☐ No

Did you participate in a middle school band program?
☐ Yes
☐ No

Did you participate in a high school band program?
☐ Yes
☐ No

Did you study an instrument before the saxophone?
☐ Yes
☐ No
REFERENCES


Howell, V. (2014, April 1). Interview with Valerie Howell [Personal interview].


Leali, B. (2014, April 1). Interview with Brad Leali [Personal interview].

Lee, E. (2007). *A study of the effect of computer assisted instruction, previous music experience, and time on the performance ability of beginning instrumental music students* (Doctoral


