

University of Louisville

ThinkIR: The University of Louisville's Institutional Repository

Electronic Theses and Dissertations

5-2010

The effect of practice with the Beatnik Rhythmic Analyzer on rhythm accuracy of non-percussion undergraduate music majors.

Aaron Patrick Klausing 1981-
University of Louisville

Follow this and additional works at: <https://ir.library.louisville.edu/etd>

Recommended Citation

Klausing, Aaron Patrick 1981-, "The effect of practice with the Beatnik Rhythmic Analyzer on rhythm accuracy of non-percussion undergraduate music majors." (2010). *Electronic Theses and Dissertations*. Paper 761.

<https://doi.org/10.18297/etd/761>

This Master's Thesis is brought to you for free and open access by ThinkIR: The University of Louisville's Institutional Repository. It has been accepted for inclusion in Electronic Theses and Dissertations by an authorized administrator of ThinkIR: The University of Louisville's Institutional Repository. This title appears here courtesy of the author, who has retained all other copyrights. For more information, please contact thinkir@louisville.edu.

THE EFFECT OF PRACTICE WITH THE BEATNIK RHYTHMIC ANALYZER
ON RHYTHM ACCURACY OF NON-PERCUSSION
UNDERGRADUATE MUSIC MAJORS

By

Aaron Patrick Klausing
B.M.E., University of Kentucky, 2004

A Thesis
Submitted to the Faculty of the
Graduate School of the University of Louisville
in Partial Fulfillment of the Requirements
for the Degree of

Master of Music Education

School of Music
University of Louisville
Louisville, Kentucky

May 2010

Copyright 2010 by Aaron Patrick Klausing

All rights reserved

THE EFFECT OF PRACTICE WITH THE BEATNIK RHYTHMIC ANALYZER
ON RHYTHM ACCURACY OF NON-PERCUSSION
UNDERGRADUATE MUSIC MAJORS

By

Aaron Patrick Klausing
B.M.E., University of Kentucky, 2004

A Thesis Approved on

April 15, 2010

by the following Thesis Committee:

Thesis Director

DEDICATION

This thesis is dedicated to my wife

Kelly Matthews Klausing

for her continuous support throughout my graduate career.

ACKNOWLEDGEMENTS

I would like to thank my professor, Dr. Amy Acklin, for her guidance and patience throughout my thesis project. Without her help, this project would have not been possible. I would also like to thank Dr. Robert Amchin for his continuous guidance and extensive knowledge in education, helping me achieve success as a graduate student. Thank you also to Dr. Greg Byrne for his help with this project and for serving on my committee. I would also like to express my sincere gratitude to my wife, Kelly, for her unconditional love and support she provided to me throughout my collegiate career. Also, many thanks to my parents, Stan and Mary Klausing, for their continued support and love in everything that I do. I would also like to thank Bob Parker, who introduced me to the Beatnik Rhythmic Analyzer, and Tab Langis, whose dedication throughout the data collection phase allowed me to complete this project. Finally, a special thanks to OnBoard Research Group, especially Mike Burgess, who provided the Beatnik Rhythmic Analyzer for this study.

ABSTRACT

THE EFFECT OF PRACTICE WITH THE BEATNIK RHYTHMIC ANALYZER ON RHYTHMIC ACCURACY OF NON-PERCUSSION UNDERGRADUATE MUSIC MAJORS

Aaron P. Klausing

April 15, 2010

The purpose of this study was to measure the effectiveness of the Beatnik Rhythmic Analyzer on rhythmic accuracy. Non-percussion music majors ($N=19$) were randomly divided to practice with either the Beatnik Rhythmic Analyzer ($n=9$) or a metronome ($n=10$). Five exercises were administered for one minute each over a three-week period. Pre- posttest scores were analyzed using a Mann-Whitney U to test for differences between the groups. While the mean posttest scores of the treatment group were higher than the control group, results indicated no significant difference between the groups ($\alpha=.05$). Lastly, two out of the five exercises resulted in large effect sizes in favor of the treatment group, suggesting that the Beatnik Rhythmic Analyzer is highly effective for developing specific fundamental techniques in snare drum playing.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	IV
ABSTRACT.....	V
TABLE OF CONTENTS.....	VI
LIST OF TABLES	VIII
LIST OF FIGURES	IX
INTRODUCTION	1
REVIEW OF LITERATURE	4
Defining Pulse, Tempo, and Rhythm.....	4
Technology and Music.....	5
Technology in the classroom.	6
Using technology to detect pitch and rhythmic errors.	6
Learning techniques.	8
Perception Studies.....	9
Pulse Perception.....	9
Tempo perception.	13
Rhythmic Perception.....	15
RESEARCH QUESTIONS	20
Need for the Study	20
Purpose of the Study	22
Research Questions.....	22
METHOD AND MATERIALS	23
Participants.....	23
Study Design.....	24

Musical Examples	24
Materials	27
Beatnik Rhythmic Analyzer.....	28
View and graphs of the Beatnik.....	28
Preparation Training Sessions.....	31
Pretest.....	33
Treatment Period.....	33
Posttest	35
Hypothesis.....	35
Limitations Of The Study	35
IRB Approval.....	36
RESULTS	37
Data Analysis Pretest	37
Data Analysis Posttest.....	39
Data Analysis of Experimental Group.....	41
DISCUSSION	44
Research Questions.....	46
Future Studies and Additional Comments.....	47
REFERENCES	49
APPENDICES	55
CURRICULUM VITAE.....	67

LIST OF TABLES

TABLE	PAGE
1. Mean-Score Comparison for Rhythmic Accuracy.....	38
2. Mean and Standard Deviation of Control and Experimental group.....	40
3. Mann-Whitney U values for Pretest and Posttest.....	40
4. Effect Size of Experimental Group (d).....	41

LIST OF FIGURES

FIGURE	PAGE
1.1. Exercise One.....	25
1.2. Exercise Two.....	26
1.3. Exercise Three.....	26
1.4. Exercise Four.....	27
2.1. Dynamics View on the Beatnik Rhythmic Analyzer.....	29
2.2. Subdivision View on the Beatnik Rhythmic Analyzer.....	30
2.3. LCD Screen explanation of the Beatnik Rhythmic Analyzer.....	31
3. Graphical Interpretation of Table 2.....	42
4. Graphical Representation of Table 1.....	43

INTRODUCTION

The advancements of the technological age have provided alternative methods and approaches to classroom instruction, changing the format and delivery of our education system (Collins & Halverson, 2010). Music educators and private percussion teachers often incorporate technology or Computer Assisted Instruction (CAI) into the classroom. With a developing technological society, engineers have also been directing software or hardware toward different facets of music education and performance. For example, music software such as Finale and Smart Music, and hardware such as iPods (Kervin & Vardy, 2007) and Silent Brass are commonly used devices in the classroom and private instruction.

The collaborative relationship of music, education and technology is not new to the 21st century. Rudolph (1996) explains how technology has been assisting performers and music educators throughout the centuries, stating:

The organ, harpsichord, piano and phonograph are all examples of technology that at one time were as amazing to those who originally used them as computers are to us today. The trumpet was played without valves throughout the Baroque era. In the Romantic period, the valve was incorporated into the design of the trumpet, and this technology revolutionized the instrument. Likewise, the invention of the silicon chip and computer microprocessor in the late twentieth century have had a great impact on music and music education (p. 1).

The Tanglewood Symposium of 1967 (Britton, Broido, & Gary) was one of the first recognitions of technology's important role in education, suggesting that "developments in educational technology, educational television, programmed instruction, and computer—assisted instruction should be applied to music study and research" (p. 139). This declaration was pivotal in promoting the use of technology in the music classroom. Technology is now a common teaching aid, not only in music classes, but also private music instruction. The National Association for Music Education (MENC, 1988) published *Opportunity to Learn Standards for Music Technology* as a guide for what schools should provide to students in grades K-12. In states located throughout the United States, technology has become a requirement for teachers. For example, Kentucky's *New Teacher Standards for Preparation & Certification* (1993) requires teachers to use technology in classroom instruction.

Private music instruction in percussion has especially benefited from additional technological resources for teaching, such as electronic drum sets and drum machines. Another example is the delay pedal, which can be used in percussion to teach rhythm accuracy. To do this, the performer plays repeated quarter notes or eighth notes on the snare drum while a microphone transmits a signal to the delay pedal, processing a synchronized consistent delay. This allows the player to aurally hear rhythmic accuracy and precision. The delay pedal, in addition to other technological developments, has aided in providing additional teaching resources for the private percussion studio teacher.

In recent years, OnBoard Research Cooperation developed a unique tool to measure the rhythm accuracy of snare drum players. The device, called the Beatnik

Rhythmic Analyzer (Beatnik), measures the exact rhythmic placement of a specific beat. Rhythmic precision is scored on the Beatnik in percentages with results displayed on a LCD screen to reflect rhythmic accuracy. In addition, exact rhythmic tendencies, i.e. whether or not the beat accuracy is early or late, is displayed on a computer generated graph.

To the authors' knowledge, no experimental studies have been conducted on the Beatnik. This study is designed to examine the effectiveness of the Beatnik on rhythmic accuracy. A randomized pre- posttest design was used with a three-week treatment period. Participants ($N=19$) were non-percussion music majors at a large southeastern university. Results from the pre- posttest scores were analyzed using a two-tailed Mann-Whitney U test ($\alpha=.05$) to determine whether there were significance differences between the treatment and control group. Additional results discuss the overall progress of the treatment group using the Beatnik.

CHAPTER 1

REVIEW OF LITERATURE

Technology has been included in the teacher's curriculum as a national standard resource. The National Educational Technology Standards were established in 1998 to include proper technology as a tool or resource for learning. Technology's inclusion in music has been a valuable asset to the music director and private instructor (Forest, 1995; Beckstead, 2001; Moore, 1992), aiding in students "performing, improvising, composing, reading, and notating music" (Bissell, 1998).

Defining Pulse, Tempo, and Rhythm

In order to specify the terminology used in the review of literature/study, a definition of pulse, rhythm, and tempo is necessary. Pulse can be defined as the "regularly recurring articulations in the flow of musical time" (London, n.d.). The word 'Pulse' can be synonymously used with the word 'Beat.' Rhythm can be defined as "movement marked by the regulated succession of strong or weak elements" (London, n.d.). In many research articles, the term 'Rhythm' is actually referring to pulse, and in some cases meaning the combination of notes in a passage. Tempo can be defined as "The speed at which a piece of music is performed" (Scholes, Nagley, & Latham). Tempo is also used in research to describe accelerating or decelerating passages.

Technology and Music

Many researchers have conducted studies that examine musical tendencies using computer-assisted synchronization tests, specific software developed to measure musical tendencies, and computer-administered instruction. These devices can measure musical tendencies including tempo fluctuation, sequencing of patterns, and pitch accuracy. Lee (2006) examined the emotional impact of a computer-animated figure to background music, demonstrating the involvement of technology to responses of music and motion in computer animation. In his study, a music diagram synchronized the proper music in tandem with the computer animation to compare what did and did not work with the animated music. Music that is linked with animation is an interesting and related topic because it requires creativity of the animator to make the music visually representative of sound sources.

Musical responses to sequenced patterns are representative of the individuals understanding of pulse. A study conducted by Bebeau (1982) addressed the traditional style of teaching rhythm verse a simplified aural teaching style. Steps in teaching styles included the evaluation of the symbol notation, defining its meaning, explaining the duration of the symbols, accenting the steady pulse, and responding to the pulse. The simplified instruction method was based of Orff and Kodaly methods. Participants ($N=27$) from elementary schools were selected to complete a twenty-three question pre-posttest. Sessions from the elementary schools were recorded using a video camera for evaluation by the researcher. Results suggested advantages of using the speech cue method over traditional methods of rhythmic evaluation. Observed results from the

researcher also suggest that class efficiency was improved when using the speech cue method.

Other elementary-based research has focused on teaching instruction. Taylor (2006) examined teacher's general ability to effectively teach class. Eight instructors and their students were videotaped for evaluation, focusing on periods where the class instruction involved refining students' performances (p. 233). Results suggest that success in a musical elementary setting by teachers has to do more with the quality of verbalization rather than the quantity. It was found that 59% of the teacher directives were procedural rather than instructional. Additionally, negative feedback or instruction was not successful unless followed by explicit directives. Since most music elementary school experiences have minimal meeting time during the week, the research suggests that instruction in the elementary setting needs to be focused and well planned.

Technology in the classroom. Much of the research based on technology in the classroom focuses on enhancing instructional techniques. Grant (1998) found that university student's motivation to learn increased by using technology. Furthermore, the students "clearly enjoyed using [technology] and report greater involvement and interest in topics that included the [technology]" (p. 11). Grant also found similar results in fifth grade students, describing "an increase in satisfaction of learning with immediate responses" (p. 11). Results revealed that the use of technology increased the student's attentiveness and overall learning experience.

Using technology to detect pitch and rhythmic errors. Understanding the reproduction of melodic material can aid the instructor in how teachers approach training students. Likewise, understanding rhythmic values can aid in understanding the melodic

material presented to students. Demorest and Serlin (1997) selected participants (N=60) from grades 1, 5, and 9 to be involved in a study that examined musical judgment as it relates to pitch and rhythm. Participants were asked to listen to a four-measure phrase from Schubert's Sonata for Violin and Piano in G minor. The phrase was repeated and participants were asked to compare the two phrases on a Likert-type scale. Results showed a significant difference ($p=.20$) in rhythmic response from 1st and 9th graders, and from 5th graders to 9th favoring the 1st and 9th graders. These results suggest that rhythm assists novices in the understanding and hearing of melodies.

From understanding melodic and rhythmic material, to detecting errors, many studies have suggested that technology aids in instruction. Ramsey (1979) examined pitch and rhythm recognition during a rehearsal. Music teachers were questioned on what types of typical rhythmic and pitch errors occur during rehearsals. Music majors (N=77) were asked to listen to 135 musical excerpts that were recorded by a university wind ensemble. The recordings included both pitch and rhythmic errors on individual instruments or sections. A pre- posttest was administered, along with three training sessions. Participants were asked to assess the listening and indicate where they heard any errors. Results suggest that pitch and rhythm detection improved from pretest to posttest, suggesting that programmed instruction is a beneficial teaching aid.

The benefit of computer-assisted instruction is a widely researched topic with varying views of influence. In a study conducted by Deal (1985), sixty-five college students were assessed using a computer program that played musical excerpts with a specific error. Participants were asked four questions after hearing the excerpt. The questions specifically asked what measure the error occurred, in what voice, if it was a

pitch or rhythmic error, and what was played (p. 161). The computer assisted by displaying if the answer was correct or to listen to the example again. The results revealed that the computer-assisted program for error detection was a successful tool for college students in detecting errors in listening examples. This result is constant to a previous study by Ramsey in 1978.

Learning techniques. Practicing is also one of the most important aspects of a musician's success. For example, it allows musicians to correctly assess the difficult passages that may arise in a particular work. However, it is the musician's practice routine that aids in developing the necessary tools for note accuracy in performance. Duke, Simmons and Cash (2009) conducted a study to explore the different approaches of practice among proficient piano players. Seventeen participants were asked to practice an excerpt from Shostakovich's Concerto No. 1 for Piano, Trumpet and String Orchestra, Op. 35. Participants were instructed to practice the excerpt until they felt comfortable enough to perform it one day later. During the experiment, participants were allowed to use a metronome and pencil for rehearsal. The results indicated that note accuracy and performance accuracy were enhanced by the rehearsal of the problematic areas when tempos were slowed down. These results reinforce the concept that practicing difficult passages at slower tempos help in producing accurate performance.

Sight-reading is another task that percussionists do. The ability to read something at sight is reflective of the student's ability as a musician. Boyle (1970) tested the theory that student's ability to read music at sight is dependent on the ability of the student to read rhythms at sight. Participants ($N=20$) were teachers from junior high school classes, and asked to spend 30 minutes a week on a set criterion of rhythmic exercises based on

the *Watkins-Farnum Performance Scale*. The treatment was administered for fourteen weeks using a pre- posttest design. Teachers were asked to use recordings, printed music, and a variety of Dalcroze techniques, such as clapping rhythmic patterns while tapping the foot, and playing rhythmic patterns on a single note. The results showed a significant gain in students' rhythmic sight-reading abilities after the training.

Perception Studies

Pulse perception. Most research in pulse perception involves synchronization tapping to an auditory stimulus. To understand pulse perception, students must understand what influences pulse, strong beats, weak beats, and syncopation. Research in the field of synchronization is important because it reveals rhythmic tendencies in musicians. Previous studies of pulse accuracy show that participants tend to anticipate the beat when tapping to a rhythm. Various technological devices are used in testing subjects for synchronization. Repp and Doggett (2007) used a very slow beat to test tone and scale sequences and how accuracy was perceived. Twenty participants in the study were asked to tap in synchrony with tones in a C major scale. They also were asked to tap the offbeat using the same sequence techniques. Different tempos were assessed throughout the study. Their results suggest musicians have a higher percentage of auditory pulse accuracy at slower tempos than the non-musicians. The results were substantially different between the two groups, suggesting that musicians have better synchronization abilities than those of non-musicians.

As indicated by Repp and Doggett's (2007) study, it is no surprise that musicians have the ability to synchronize tempo better than non-musicians. Repp (2008) refers to this as negative mean asynchrony, which is tapping that occurs milliseconds before the

beat. However, synchronization of steady pulse is not representative of offbeat recognition. Repp addresses the issue of subdivision beat treatment on pulse. Four different experiments were tested, all in conjecture with beat accuracy. For the first experiment, participants ($N=31$) tapped the beat they heard and then continued to tap the pulse after it was stopped. In the second experiment, subdivisions of the beat were added. Experiment three tested the notion of tempo acceleration or deceleration in a music sequence. The fourth experiment asked participants to reproduce perceived tempos they heard on a percussion pad by tapping the exact beat they heard. Combined results of the experiments suggest that subdivision of a beat slows down the perception of pulse more so in non-musicians than musicians.

Others studies have examined pulse accuracy as it relates to speed. According to Repp (2005), “musicians must coordinate their actions with great temporal precision” (p. 165). Repp suggests that pulse can be challenging both at slower and quicker tempos because of the space allocated for each tempo. Two questions were presented in the study: (1) at what pulse does an individual max out at tapping on and off beat patterns, and (2) what type of accent patterns aid in synchronization? There were four different experiments tested, each group having eight to ten participants ($N=36$). Each experiment examined the participant’s ability to either aurally perceive pulse on- or offbeat. Repp confirmed a hypothesis by London (2002, 2004) that presumed the shortest possible beat duration is about twice that of the shortest possible subdivision duration (p. 183). Results revealed that rhythmic structure was more difficultly perceived by its physical quickness rather than the cognitive interpretation of the rhythms.

Interpreting pulse synchronization of individuals is also important to understand. However, studies that only test synchronization to computer-generated material is not a realistic musical environment, given that many musicians have to synchronize their pulse with a conductor. Luck and Toivianen's (2006) examined synchronization of a conductor's pattern within an ensemble using an optical motion capturing system to determine if an ensemble plays before, after, or right on the pulse of the conductor. Their performance in an ecological setting aids in the development for extraction of audio and video movement for analysis. The rehearsal sound was recorded along with the motion capture system to allow for synchronized viewing of the conducting patterns. Twenty minutes were recorded tracking a conductor rehearsing with a choir and orchestra. After the recordings were made, four excerpts were chosen for interpretation, two with high clarity and two with low clarity. The researcher determined clarity by selecting the most and least clear examples of synchronization of music with the ensemble. Results suggested that the ensemble has a tendency to lag behind just slightly from the conductor.

Inconsistency between Luck and Toivianen's (2006) and Repp's findings (2008) suggests that pulse synchronization is either late in an ensemble setting or early in an isolated setting. However, both studies do reveal that beat accuracy among individuals is not exactly precise. Additionally, understanding where the pulse lays in a metric pattern aids in aural development. McKinney (2006) conducted a series of experiments in which listeners were asked to tap the most salient pulse of the musical example, which is the most apparent tempo. The researcher asked participants ($N=40$) to examine distributions of tapped tempi from a single musical example in order to see if the global resonance of

preferred tempo is dependent on the musical content. Results revealed that perceived tempo is different dependent upon the musical experiences of the listener. For some musical excerpts, the distribution of perceived tempi conforms to the most common metrical levels with tempi near 120 BPM. These tempos were perceived as the most recognizable, while for other excerpts, the perceived tempo sat well above or below 120 BPM. The results of the McKinney study suggest that as tempos get faster, those participants tempo perceptions changes, reflecting a mix of correct tempi and half tempi.

Understanding the salient pulse of music is the first stage in recognizing complex meters. Percussion solo and ensemble music characteristically will contain complex meters. Researchers Snyder, Hannon, Large, and Christiansen (2006) examined how people interpret complex meters. Participants ($N=24$) were from a large university and asked to tap a Balkan-style complex meter based on 7/8 time signature. An auditory stimulus test was administered to evaluate synchronization, using two measures of tones as a lead in. After tapping to the music, the music was then stopped and participants were asked to continue tapping the strong pulse. The results suggested a close relation to the actual pulse during the synchronization phase, and a closer relation to duple pulse during the continuation phase. The article further suggests that cultural perspectives may play a role in the synchronization of complex meters.

Other research in auditory and *kinematic* synchronization supports the notion that timing accuracy is influenced by the sensory information perceived between strong beats. For example, Loehr and Plamer (2009) investigated the ability of pianists' to sequence melodies both visually and aurally. Participants ($N=17$) were asked to play two sets of four measure melodies. Each melody was to be played on a piano, using the right hand

only on the first five notes of either a C scale or G scale. The melodies included material on the beat, off the beat, and a combination of both. A three-dimensional motion capturing system was used to capture the exact timing of the melody being performed on a keyboard by the participants that were listening to a midi playback device. The results of this study suggest that the accuracy of pulse is influenced by the sensory information that occurs between the different beats. In other words, the physical act of moving from one note to another note determines the pulse accuracy of the performer.

Tempo perception. Education training in pulse accuracy as it relates to tempo perception is valued as important for musical abilities. Studies conducted in tempo perception vary from aural recognition to visual influence. In a study by Duke (1989), 300 participants were asked to listen to two musical examples and indicate if the first example played had a faster or slower tempo compared to the second. Thirty-six examples were taken from Gustav Holst's First Suite in E-flat for Military Band. Each example had some type of variation using the main rhythmic figure of quarter notes, eighth notes, eighth-note triplets, or sixteenth notes. The tempo provided for each example was either MM=100 or MM=112, representing a 12% difference between the tempos. Participants were to indicate if the tempo played of the second example was faster, slower, or neither faster nor slower. The results of the study suggest a clear indication that listener's assessment of tempo perception is directly related to the melodic rhythmic passage being played. Younger and untrained musicians showed a significant difference ($p < .001$) between those of undergraduates in identifying the rhythmic changes. Understanding the reasons for altered tempo perception is an important music topic for teacher education.

Music can accelerate or decelerate, which influences the interpretation of tempo. Wang (1984) conducted a study that tested effects of different aspects of rhythm as it related to perception of tempo. Rhythm pattern, texture, beat location of tempo change, and direction of tempo change were observed in eighty-eight participants (p. 169). Participants were asked to listen to a musical example and determine if the tempo had increased or decreased. Results of the study suggest that students need more time to evaluate whether or not a musical phrase is perceived as increasing rather than decreasing in tempo.

Visual stimuli that affect tempo synchronization are solely based on visual cues. Conductors in a large ensemble and performers in a small ensemble are affected the most. Luck and Sloboda (2009) investigated how visual synchronization with conducting patterns affect individual perception of tempo. Twenty-four participants were asked to tap the visual tempo they perceived while watching a point-light that projected the normal gestures of a conducting pattern. A conducting pattern in 3/4 time was shown at slow, medium and fast tempos with small, medium and large conducting size patterns. The results of the study suggest that the speed of the conducting pattern is more influential than that of the changes in direction.

The ability to synchronize [peoples] movements to those of a periodic external stimulus is a widely studied phenomenon. Most of this research has focused on synchronization with auditory stimuli, and has shown that people are able to achieve a high level of synchronization with stimuli presented in this modality (p. 465).

Researchers have investigated visual-tempo perception using varied musical material. In a two-experiment design, Rankin, Large, and Fink (2009) investigated tempo fluctuation amongst four different stylistic pieces during a performance. The first experiment tested the ability of skilled piano players to play with natural tempo fluctuation. The second experiment tested participant's ability to follow those natural tempo fluctuations by tapping the tempo of the recorded work. The results showed that the participants were able to predict the pulse fluctuations and tempo changes.

Other studies suggest that increasing or decreasing tempos is affected by visual contact. Schulze, Cordes, and Vorberg (2005) examined synchronization with a metronome that created both an accelerando and ritardando, while analyzing the transition phase. Five volunteers were tested using twelve different metronome settings. The results showed that a pattern emerged for both the accelerando and ritardando tempos. If the initial and final tempo varied widely, participants tapped below then above the smoothly changing pulse before settling on the goal tempo. These results suggests that visual contact is important for tempo changes within an ensemble, and that tempo changes can be rehearsed to their trajectory for improvement.

Rhythmic Perception. Adults, children, and infants all have different sense of musical perceptions that excite them. Trehub and Hannon (2006) conducted a study reviewing the literature of infants' perception of temporal patterns and pitch. The literature then was compared to that of adult and non-human listeners to see if there were any correlations. Results indicated that human listeners generally associate auditory listening to that of sequences set up in patterns, while non-human listeners focus on single pitches of tones. Additional results suggested that music perception is species-

specific, which is consistent with the learning constraints of the specific human or non-human musical perceptions. Lastly, results revealed that infant's perception skills of music are neither music-nor species specific.

Researchers have also sought to understand how musicians identify and replicate rhythms. Fitch and Rosenfeld (2007) investigated the abilities of musicians to perceive, process, and produce difficult rhythmic passages. To test this idea, sixteen undergraduate students were asked to reproduce three different types of rhythmic phrases: (1) tapping along with the rhythms they heard, (2) reproducing patterns after a pulse was established, and (3) identifying these patterns after 24 hours. The results of the study suggest that as rhythms become more syncopated, there is a decrease in beat percentage accuracy during reproduction of syncopated patterns. Additional results suggest that musicians can accurately syncopate rhythms within isolated instances tempo changes. Lastly, the researchers found that syncopated patterns are more difficult to recall over a duration of time.

Research has also suggested that hearing rhythmic values can be interpreted differently when an anacrusis is involved. London, Himberg and Cross (2009) conducted a study on the perception of an anacrusis. The study focused on three experimental ideas of investigation and interaction between the aural perceptions of an anacrusis and its actual notation. Participants ($N=33$) in the study were asked to tap the beat they heard after three to five counts of recorded music. Two separate analyses of the recorded material were played; one using ascending and descending sequences and the other using repeated tones in the sequences. The study centered on the perception of the beat placement. Results indicated that rhythms in melodic structures do not act the same as

complex melodic structures, suggesting an interaction between melodic and rhythmic perception in aural listening.

Examining the interactions between melody and rhythm and their effect on listeners' perceptions could provide an understanding of rhythmic perception. For example, Boisen (1981) compiled a study that tested public school students' understanding of melodic context and its relation to rhythm. Students ($N=2207$) from 15 public schools were asked to listen to rhythmic patterns and identify whether they were complete or incomplete. The results suggested that melodic content determines if students aurally perceive rhythmic accuracy and completeness. Boisen notes that people need melodic material to determine if a musical phrase is complete.

Variations of tempo could also influence rhythmic perception. Duke (1994) examined rhythmic perception of non-music majors at a major university as well as musicians in third, fourth, and fifth grades. Duke suggests that musicians tend to organize rhythm in terms of metric relationship and that non-musicians tend to perceive rhythms together (p. 33). In Duke's study, participants ($N=320$) listened to twenty different sets of two musical examples, in which they were to indicate whether the rhythm was the same or different. Results of the study suggested that listeners could hear the rhythm easier at a faster tempo versus a slower tempo. Duke states that "teachers [should] be aware of differences between their own perceptions and the perceptions of their students." (p. 33)

Computer-assisted teaching devices allow for different perspectives of rhythm perception. Placek (1974) used a computer-assisted rhythm lesson for undergraduate elementary music education majors. The computer program used in Placek's work was

designed for students to demonstrate two objectives: (1) demonstrate a basic knowledge of rhythm notation, and (2) demonstrate a knowledge base of aural listening to notational rhythmic patterns. The purpose of the study was to develop a program that would enhance the abilities of student's rhythmic perception by means of a computer-assisted lesson. Data was collected from the program over a two week period. Qualitative data suggested that students enjoyed using the program. Results suggested that there was improvement from pre- to posttest scores.

Complexity of rhythmic perception is based on an individual's rhythmic aptitude. Povel and Shumulevich (2000) devised a study that would test participants on their ability to score complex rhythmic patterns. Participants ($N=24$) were asked to score a three measure rhythmic pattern on a one to five Likert-type scale. Participants could listen to the example as many times as they wanted and could also change their answer. The first measure was based on the idea that temporal patterns can be described as simple patterns, while the second measure was based on a more complex rhythmic sequences. The final measure was based on coding rhythmic ideas. Results suggested that the rhythmic pattern complexity determined the overall score, suggesting that individuals can perceive complex patterns.

It is also important for musicians to differentiate between perception of complex rhythms and the basics of pulse perception. Studies have been done on pulse accuracy of students that use foot tapping as a metronomic precision tool as opposed to a metronome. Debbie Rohwer (2005) specifically addressed this point in a study, which showed no significant improvement between the two. This conclusion may have been the result of the student's cognitive rhythmic development. Rhythmic perception can only be

developed if a student understands what that is. Gembris (2002) stated: “Even though children already seem to have some rhythmic awareness and are able to distinguish between simple rhythms, a more precise perception of rhythms develops only gradually” (p. 132).

The physical aspect of playing is very important to persistence of rhythm. Wind players can physically blow air in a rhythmic pattern, string players can physically feel the motion of a bow stroke, and percussionist can physically feel the rhythms of which they play. The physical value of playing helps percussion students understand rhythmic accuracy. Shull and Berg (1994) said “[Middle School] students feel valued when provided with opportunities to *experience* music by performing, creating, and listening to learned skills and grow in knowledge of the subject” (p. 14). This physical movement of creating allows the percussionist to hone in on skills that can only develop through experience.

Kuhn and Gates (2006) found in a study that most students tend to speed up rhythm during performance. This is another problem common in beginning percussionist. With a variance on age, and different rhythms, Kuhn (2008) concluded that most students increased tempo performance on average five beats per minute after an initial tempo was provided (pp. 291-298).

Given that many young percussion students struggle with rhythmic accuracy, and that technology can be a useful aid in learning, then it seems that the inclusion of technology could improve the rhythmic accuracy of beginning percussion students.

CHAPTER 2

RESEARCH QUESTIONS

Need for the Study

Although there have been an increasing number of technological devices available to percussion instructors, such resources are lacking for the band or orchestra director who teaches percussion in large group settings. Instead, many teachers rely on the guidelines suggested in methods books, however, rarely do these books mention how a percussionist should further develop their rhythm accuracy. For example, Cooper's (2004) *Teaching Band and Orchestra* offers numerous methods and procedures for brass, wind and orchestra members, but does not give suggestions for the development of the percussionist rhythm accuracy.

Rhythm accuracy appears to be a developed skill. Percussionists are often faced with the daunting task of being the rhythmic leaders within an ensemble, but developing accurate rhythm in a large group setting seems to be a common problem for many percussionists and a gap in their education. Thus, an understanding of the fundamental concepts of good rhythm is vital to being a percussionist. Rudolph (1996) submits "all percussionists should obviously be leaders in the total ensemble in rhythmic and precision study. They must also be involved in the total balance of sound being created within the ensemble." (p. 101)

It is important for percussionists to develop physical motor skills of playing accurate rhythms. The development of rhythmic accuracy can come from physical movement, experience and experimentation. Cook (1998) in *Teaching Percussion* explains two important components of experiential learning:

1. Being aware of all aspects of the experience.
2. Avoiding or reducing all forms of mental and physical interference. (p. 4)

Cook further explains that teachers should reduce all obstacles that get in the way of natural learning to guide the students to an awareness of the present experience, stating: “This awareness includes sensitivity to all visual, auditory, and kinesthetic body sensations and an *acceptance* of what is happening so that learning is free to take place.” (p. 4) It is within these parameters that the student identifies rhythmic precision so that experiential learning can begin.

The development of rhythm can also be referred to as “sensorimotor synchronization,” as noted in Repp and Doggett’s (2007) study as “the coordination of physical action in time with a rhythmic sequence, and thus is highly important in music performance.” (p. 367) Percussionists use physical actions as well as muscle memory to create rhythmic patterns on instruments. It can be argued the importance of rhythmic accuracy and precision coincides with not only with the total development of the percussionist, but also the awareness they have in a large ensemble.

Given the value of setting goals and planning ahead for student success, it seems that additional questions should be considered when teaching percussionist. Why should percussionists be able to have rhythmic accuracy? What will such skills provide for the students overall experience in music?

Purpose of the Study

To address these questions and teaching concerns, this study focuses on the Beatnik Rhythmic Analyzer, a device developed to improve rhythmic accuracy for percussionists. According to OnBoard Research Corporation (2006), percussionists will benefit from using the Beatnik “in ways never before imagined or possible.” The intent of this study is to evaluate the usefulness of the Beatnik on rhythmic accuracy of non-percussion undergraduate music majors.

This study used a randomized, pre- posttest experimental design. Participants ($N=19$) were given a rhythm pretest followed by a 3 week treatment period. The control group ($n=10$) practiced with a metronome during the 3 week period, while the treatment group ($n=9$) practiced with the Beatnik. A posttest was given to both groups at the conclusion of the study.

Research Questions

The following were the central research questions in this investigation.

- 1) Does the Beatnik Rhythmic Analyzer improve the rhythmic accuracy of non-percussion music majors?
- 2) Are there significant differences between using a metronome verses the Beatnik Rhythmic Analyzer on rhythmic accuracy of non-percussion music majors?
- 3) Will repeated use of the Beatnik Rhythmic Analyzer improve the rhythmic accuracy over time?

CHAPTER 3

METHOD AND MATERIALS

The purpose of the study is to determine the efficacy of using technology to improve rhythmic accuracy in beginning percussion students. As described in the introduction, OnBoard Research's Beatnik device was used to collect data on students' achievement in rhythm accuracy. This study will evaluate the progress of nineteen participants rhythmic accuracy with the use of either a metronome or the Beatnik.

Participants

Two undergraduate music classes from the University of Louisville were selected for participants: a beginning level conducting course and a percussion methods class for non-percussion majors. The classes included primarily instrumental and vocal music education majors who were required to take the course in fulfillment of their degree. As a caveat, students only could be involved in the study if they met two requirements: (1) The students were non-percussionists, and (2) the students were either currently enrolled in percussion methods or had not taken the percussion methods class. This was to insure that the data collected would reflect accurate results of newly trained percussion players on rhythm accuracy.

Out of the fifty-three students in the conducting class, twelve students agreed to participate in the study. Due to absenteeism, only nine completed the entire study. Out of the ten students enrolled in the percussion methods class, all ten decided to participate

in the study. Because of absenteeism, one student's data had to be removed from the study. All students from both classes gave their consent for participation.

Study Design

The study used a pre– posttest research design. Students enrolled in the conducting class were asked to have two training sessions on snare drum fundamentals before the pretest. Students enrolled in the percussion methods class received fundamental training three-weeks prior to the study. Further discussion of this is included in the “Preparation to Study” section.

The researcher introduced the idea to participate in the study during normal class meeting times. After the introduction of the study, a consent form was passed out to all 63 students, 53 in the conducting class and 10 in the percussion methods class. Participants were randomly placed into either the control group or treatment group.

Musical Examples

The researcher developed four exercises that focused on fundamentals of snare drum technique. Exercises were chosen from the researchers experience teaching beginning percussionist. Each exercise was chosen for its developmental technique and compiled so that students could memorize the passages quickly, working on the techniques presented without looking at the music. The reason for this was to insure that participants using the Beatnik would look at responses from the device. In addition to the four snare drum exercises, sight-reading examples were selected from Reeds (1959) *Progressive steps to Syncopation for the Modern Drummer*. This method book was chosen because it is a standard tool for teaching beginning drummers' rhythms and strengthening sight-reading skills. It was also voted second on the Modern Drummer's list

of 25 Greatest Drum Books in 1993 (Miller). The book has a variety of basic and advanced repeated rhythm patterns. Each sight-reading example was selected for its ease of syncopated rhythms and use of repeated figures. Sight-reading examples can be seen in Appendix C through H.

The first exercise, 8 on a hand, (Figure 1.1) was used for individual assessment of proper technique. This exercise was easy for students to play while looking at their hands for technique corrections. Stick heights and placement of snare stick beads were addressed in training, making sure that the stick heights were no higher than 9 inches, and that the stick tip stay close to the center of the drum.

Figure 1.1. Exercise One
8 on a hand

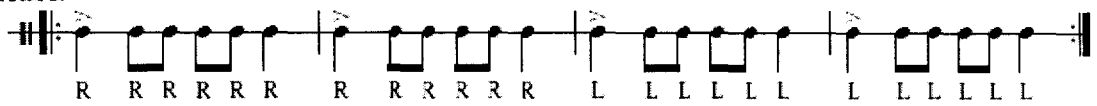
R R R R R R R R L L L L L L L L R R R R R R R R L L L L L L L L

The second exercise was called FREEZE (Figure 1.2), and focused on the downstroke motion. The downstroke was explained during training as an accented note. One accented note followed by subsequent softer notes was explained as “freezing the first note after striking the drum, followed by smaller taps.” This exercise addressed the need for correctly playing a downstroke, and the technique involved.

The third exercise was called Paradiddles (Figure 1.3). This exercise was explained in training as one of the 40 Percussive Arts Society (PAS) rudiments. During training, the researcher explained that rudiments are the fundamental ideas and

Figure 1.2. Exercise Two

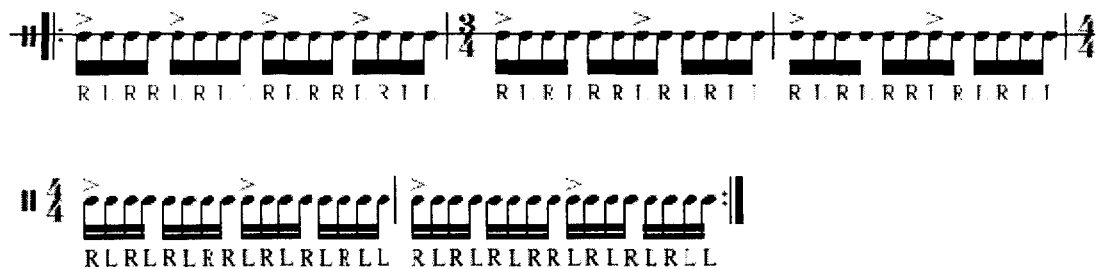
FREEZE



techniques that snare drum players' use. The Paradiddles exercise addressed three of the 40 rudiments: paradiddle, double paradiddle, and triple paradiddle. Each rudiment was described and modeled in detail, followed by participants playing each rudiment separately. After five repetitions of each rudiment, participants were asked to play each paradiddle four times, as noted in the exercise.

Figure 1.3. Exercise Three

Paradiddles



The fourth exercise addressed was labeled 5-Stroke roll (Figure 1.4). This exercise was again explained as one of the PAS 40 rudiments. The researcher demonstrated how to make a double stroke on each hand (a double being two right hand

or two left hand strokes). They were instructed that fingers are used for bounces, doubles and rebound strokes.

Figure 1.4. Exercise Four

5-Stroke Roll



The tempo for each exercise was selected at quarter note equals 60 BPM. A slow tempo was selected to aid beginning snare drum players in successfully finishing the exercise.

Materials

The Beatnik has a variety of features that allow the user to view the exact rhythmic precision of a passage or set of patterns. An advantage of using this percussion technology is the physical and visual aspects of practicing and seeing exactly where the rhythm lies (i.e. before the beat or after the beat). The Beatnik generates an accuracy percentage, which was the primary source of data for this study. The Beatnik also has a built-in metronome that interacts with the analysis, however that function was not used when testing rhythmic accuracy.

For this study, the RA1200P Beatnik by OnBoard Research Corporation was used for the experimental group. The BOSS Metronome Dr. Beat DB-90 was used for the control group. The timer that was used was a Digital Kitchen Key Pad Timer, model 00535, made by Acu-Rite. Headphones used in the study were provided by the University of Louisville's music library.

Beatnik Rhythmic Analyzer. Participants were pretested on five exercises for rhythmic accuracy, as measured by the Beatnik (Appendix A). The Beatnik measures the accuracy of timing precision of each stroke, displaying the total calculation of accuracy as a percentage. The percentage for each exercise was recorded and used in pre- posttest comparisons to determine if the Beatnik improved rhythm accuracy.

The determination of which Analyzer to use on the Beatnik was chosen for its visual and rhythmic demonstration of each exercise. Part of the decision process when using the Beatnik is selecting an appropriate “Analyzer” setting. The “Analyzer” refers to the Beatniks ability to compile input data in different formats and has four different functions. Additionally, the creator of the Beatnik, OnBoard Research Corporation, was contacted for suggestions. A recommendation for difficulty setting was recommended at “Medium” and graphical settings for analysis were provided. OnBoard Research Cooperation suggested this setting as the starting level for beginning snare drum players.

View and graphs of the Beatnik. The Beatnik was chosen for this study because of its reliability and precision of recording exact rhythms. The Beatnik is also very easy to understand and use. The manual explains the Beatnik Subdivision Analyzer as the following:

Subdivision Analyzer shows a separate vertical click marker for each subdivision of the beat. The data display’s total width represents one complete quarter note beat, and each of the 128-pixel columns represents one 512th note. The [percentage] is based on the timing precision of each note in relation to the metronome, as well as the selected skill level.

Figure 2.1 shows an example of what the *Dynamics* view looks like. As a player continues to play repeated specific rhythms, a dot is graphed on the LCD screen according to accuracy, which creates a graphical representation overtime. As the player continuously plays the rhythm, accuracy of pulse can be graphically examined. The graph can be used to determine if a player is early, late, or right on the beat with the sequenced rhythmic pattern. The parallel dotted lines represent exact accuracy, while anything before or after the dotted lines represent a note that was played before or after the beat. For example, Figure 2.1 shows 32nd notes playing at 150 BPM. Additionally, the LCD screen shows that the player's actual tempo is 145 BPM, and that their accuracy is at a 72% based on the low (L) skill level setting. The graph in Figure 2.1 reveals that most notes are within the parallel dotted lines, but that some values are early or late. All exercises in this study, with the exception of 5-Stroke Roll, used this graph.

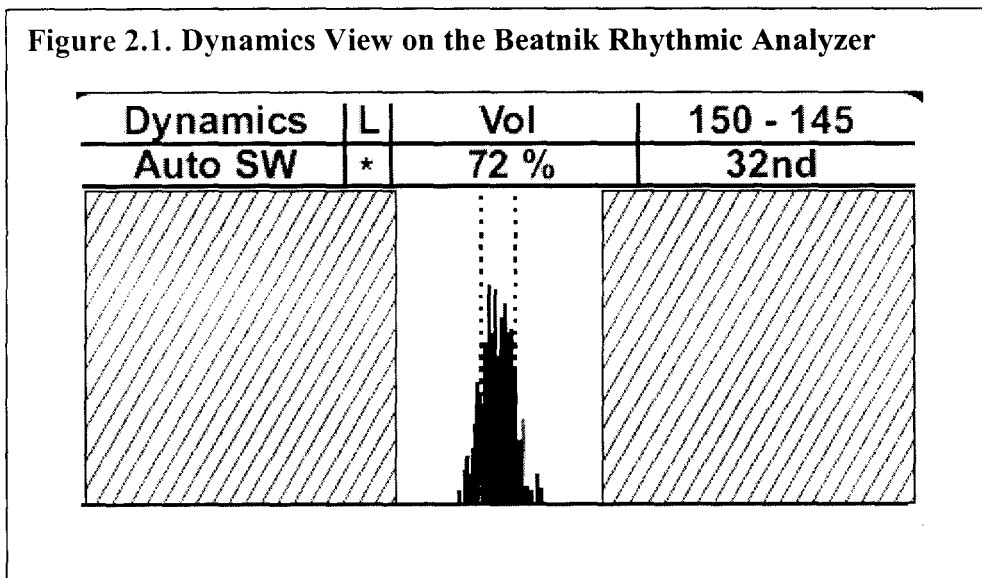


Figure 2.2 is representative of the Subdivision analyzer. This analyzer shows the accuracy of each beat. For this example, a 5 tuplet (5 over 1) is the single beat duration. Each set of dotted lines represents one complete beat of this rhythm. As a player would continuously play this pattern, a graph similar to Figure 2.1 would accumulate. The advantage of using this type of graph is that it breaks down each individual sub-divided beat, revealing timing tendencies. This graph was used for the 5-Stroke Roll exercise because it graphs individual beats. A five-stroke roll uses multiple bounces between hands. Being able to see the individual sub-divided beats on this type of graph would reveal tendencies of the player's stroke technique. A description of the top of the LCD screen can be seen in Figure 2.3.

Figure 2.2. Subdivision View on the Beatnik Rhythmic Analyzer

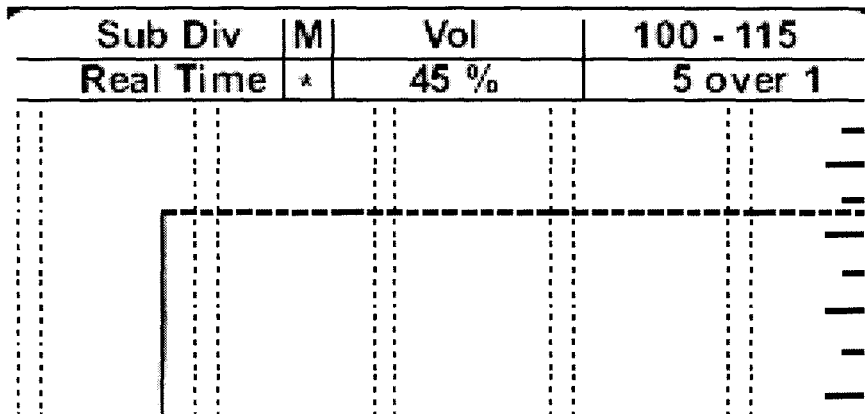
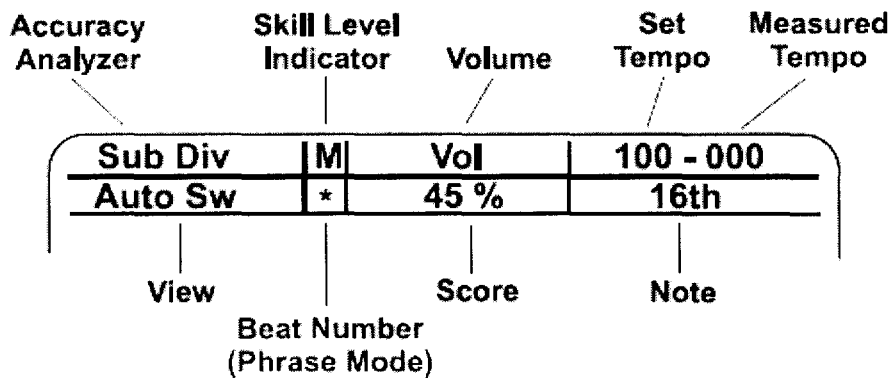


Figure 2.3. LCD Screen explanation of the Beatnik Rhythmic Analyzer



Preparation Training Sessions

To ensure that all participants had the necessary skills for the study, the conducting class received two training sessions before the pretest. The percussion methods class had already learned the specified exercises as part of the regular class curriculum. All participants received a 5-8 minute training session with the Beatnik to allow participants to become familiar with the technology.

During the first training session with the conducting class, participants were given basic instructions on how to hold snare drum sticks and taught fundamentals of playing snare drum. Smaller groups were taken out of the class for instruction. During the 10-minute introduction, each group was given directions on snare drum grip and technique. Instructions on the snare drum grip included holding the stick on the bottom third of the shaft, keeping the pads of the fingers on the stick, keeping the palms faced down while playing, making a triangle between the sticks and body, and holding the stick between the thumb and first finger. The concepts were demonstrated, and each individual was asked

to play quarter notes for technique evaluation by the researcher. Assessment of playing and corrections were made as necessary. Next, groups were asked to play the four exercises that were going to be used for this study. Each exercise was explained in tandem with the specific techniques that the exercise was addressing.

To complete the first training session, a preliminary assessment of the individual's ability on snare drum needed. The assessment used was the Paradiddles exercise. This exercise was drawn on a large poster board so that the individuals could read it while playing. Each individual was asked to play the example to the best of their ability and was scored on a four-point Likert-type scale ranging from poor to excellent (Appendix I). Students were assessed on good technique and rhythmic ability by the researcher. An assessment test was necessary because the percussion methods class had already received snare drum technique training. The results of the test indicated that all participants could demonstrate grip technique and technical abilities at either the "good" or "excellent" assessment rating.

During the second meeting with participants of the conducting class, continuations of previously discussed elements were reviewed and explained, including technique, grip and gaining familiarity of the exercises. Each participant demonstrated his or her abilities for each exercise and the researcher suggested assessment/improvement.

Following the two training sessions with the conducting class, all participants from both classes received training on how to use the Beatnik. Participants had a chance to use the Beatnik and practice 8 on a Hand and Paradiddles. Learning to interpret the Beatnik's screen was explained by the researcher as "focusing on the middle dotted line

to see the exact beat.” Participants were encouraged to stay within the dotted lines for rhythmic accuracy. It was also explained that only half of the participants would be able to use the Beatnik, while the other participants would be using a metronome. The researcher also addressed questions from participants pertaining to snare drum grip, technique, or the Beatnik. Additionally, a hand out was given to the conducting class that included snare drum techniques discussed in the pre-training sessions (Appendix J).

Pretest

Participants were asked to play the five example exercises on the Beatnik. Two participants were tested simultaneously using two different Beatnik devices. Each participant had headphones connected to the Beatnik and were separated in an isolated room to insure that noise or outside distractions would not interrupt the study. Additionally, the two Beatniks were metronomically set to each other by the researcher at 60 PBM.

The participants were asked to play each example on the machine. The screen of the Beatnik was hidden so that participants could not see the score posted on the LCD screen. One minute was set on a standard digital countdown clock. Upon pressing the start button, students were asked to play each exercise for an entire minute. The Beatnik settings were changed as necessary between each administered exercise session. The researcher recorded the percentage score after each exercise, including Sight-Reading. An example of the exercise and instruction is given in Appendix B.

Treatment Period

During the three-weeks of treatment, each participant had one minute to practice each exercise and one minute to practice sight-reading. The control group practiced with

a metronome and headphones, while the experimental group practiced with the Beatnik. All participants were instructed to stop after one minute of practice.

There was no tracking of progress for the control group during their practice sessions. The experimental group's progress was charted for each exercise during the treatment period. Participants in the treatment group were also given a practice log to track any progress made during their treatment (Appendix K).

During the treatment sessions, the experimental group used the Dynamic Analyzer and History 1 view on the Beatnik, and Subdivision and Auto-switch view on the 5-Stroke Roll exercise. Students needed to press the corresponding buttons on the Beatnik to change to the specific exercises. A written document that explained how to select the correct analyzer for each specific exercise was available during the treatment period (Appendix B). For example, when playing the exercise Paradiddles, participants had to select the 'NOTE/BEAT' button to change the note value from eight notes to sixteenth notes.

Two Beatniks and one metronome were set up in the room. Each device had headphones attached, and each participant had a copy of the musical examples on a stand. A different Sight-Reading exercise was selected for each session. The material for all sight-reading examples can be seen in Appendices C-H. Students that missed a treatment session were asked to make up the time during the week they missed. Each participant successfully complete each treatment session and there was at least one day in-between each practice session.

Posttest

The posttest was administered after the three-week treatment period and was identical to the pretest. As in the pretest, participants were not able to see their scores. The researcher or the researcher's assistant tabulated results.

Hypothesis

H_0 : There will be no significant difference in the rhythmic accuracy between the control group and treatment group.

H_1 : There will be a significant difference in rhythmic accuracy between the control group and treatment group.

Limitations Of The Study

One limitation of this study was the small sample size. With a larger number of participants, a stronger statistical test could have been used. For example, the t -test requires three different assumptions to be considered robust. Given that the design of this study did not meet two of the three assumptions, the Mann Whitney U was chosen as an alternative to the t test.

Another limitation of this study was the availability of isolated rooms for individual sessions. During pre- posttest and treatment periods, participants were isolated in a room together. Although participants had on headphones, it was not possible to block the noise of others practicing, which could have affected the rhythmic accuracy. Another study might want to isolate individuals in separate rooms.

Additional limitations would include the grade level and age of the participants. Using middle school, high school, or non-musicians all would suggest different results.

The human element of music has fluctuation of tempos, rubato, and phrasing structures. The Beatnik specifically develops accuracy as it pertains to exact tempo. The Beatnik limits the ability to teach these fluctuations, but aids in developmental skills in rhythmic accuracy.

IRB Approval

The protocol for this study was submitted to the IRB for review and was approved with exempt status. Official consent forms were not required.

CHAPTER 4

RESULTS

Students from two different music education classes took part in the study, resulting in a combination of 19 participants. Each participant completed a pretest, four sessions of treatment, and a posttest. Scores were recorded using the Beatnik and based on a range from 1 to 100 percent, where 100 represented the most accurate score. The skill level was set at “Medium” which was calculated by a tolerance of five 512th notes. For example, for a participant to score a 100%, their stroke must be within five 512th notes of the actual beat. The participants played five different exercises and each score was recorded. The mean and standard deviation of each percentage score was calculated. In addition, a Mann-Whitney *U* test was calculated to compare differences between the two groups ($\alpha=.05$).

Data Analysis Pretest

The following section compares the overall mean and standard deviation between the pre- posttest scores of the control and treatment group. For the control group, there was a difference between the average standard deviation from pretest to posttest. The control group average pretest mean was 39.64 ($SD = 13.76$), while the experimental group was 30.98 ($SD = 18.15$). These are summarized in Table 1. Individual scores for the pretest exercises report as follows: for the exercise 8 on a Hand, the control group’s mean score was 39.10 ($SD = 15.42$), while the experimental group’s mean score was 29.67 ($SD = 14.74$). Exercise FREEZE reported a mean score of 33.90 ($SD = 16.55$) for

the control group and a mean score of 26.78 ($SD = 13.77$) for the experimental group. Exercise Paradiddles yielded a mean score for the control group of 36.30 ($SD = 12.20$) while the experimental group's mean was 26.78 ($SD = 25.91$). For the exercise 5-Stroke Roll, the control group's mean score was 49.30 ($SD = 9.43$) while the experimental group's mean score was 41.56 ($SD = 20.98$). For the Sight-Reading, the control group's mean score was 39.60 ($SD = 15.19$) and the experimental group's mean score was 30.11 ($SD = 15.34$). Table 2 summarizes these findings.

A Mann-Whitney U test was calculated for each of the pretest exercises. For the control group's pretest, the following U numbers are as follows: 8 on a hand yielded a $U=26$, FREEZE yielded a $U=36.5$, Paradiddles yielded a $U=59.5$, 5-Stroke Roll yielded a $U=39$, and Sight-Reading yielded a $U=32.5$. For the experimental group's pretest, the following U numbers scored as follows: 8 on a hand yielded a $U=64$, FREEZE yielded a $U=53.5$, Paradiddles yielded a $U=30.5$, 5-Stroke Roll yielded a $U=51$, and Sight-Reading yielded a $U=57.5$. Table 3 summarizes these findings.

Table 1
Mean-Score Comparison for Rhythmic Accuracy

Variable	Mean	SD
Control group		
Pretest	39.64	13.76
Posttest	49.94	13.13
Experimental		
Pretest	30.98	18.15
Posttest	58.62	11.28

Data Analysis Posttest

The following presents the results of the posttest scores from the Beatnik. The control group average posttest mean was 49.94 ($SD = 13.13$) and a 58.62 ($SD = 11.28$) for the experimental group. These are summarized in Table 1. Individual scores for the pretest exercises report as follows: for the exercise 8 on a Hand, the control group's mean score was 53.10 ($SD = 9.95$), while the experimental group's mean score was 57.00 ($SD = 14.52$). Exercise FREEZE reported a mean score of 41.30 ($SD = 17.16$) for the control group and a mean score of 54.89 ($SD = 8.31$) for the experimental group. Exercise Paradiddles yielded a mean score for the control group of 58.30 ($SD = 5.93$) while the experimental group's mean was 60.67 ($SD = 10.04$). For the exercise 5-Stroke Roll, the control group's mean score was 53.80 ($SD = 13.19$) while the experimental group's mean score was 62.67 ($SD = 11.60$). For the Sight-Reading, the control group's mean score was 43.20 ($SD = 19.43$) and the experimental group's mean score was 57.89 ($SD = 11.91$). Table 2 summarizes these findings.

A Mann-Whitney U test was calculated for each exercise for the posttest exercises. For the control group's posttest, the following U numbers are as follows: 8 on a hand yielded a $U=62$, FREEZE yielded a $U=68.5$, Paradiddles yielded a $U=49.5$, 5-Stroke Roll yielded a $U=60.5$, and Sight-Reading yielded a $U=62.5$. For the experimental group's posttest, the following U numbers scored as follows: 8 on a hand yielded a $U=28$, FREEZE yielded a $U=21.5$, Paradiddles yielded a $U=40.5$, 5-Stroke Roll yielded a $U=29.5$, and Sight-Reading yielded a $U=27.5$. Table 3 summarizes these findings.

Table 2

Mean and Standard Deviation of Control and Experimental Group

	Pretest		Posttest	
	Mean	SD	Mean	SD
<i>Control Group</i>				
Eight on a Hand	39.10	15.42	53.10	9.95
FREEZE	33.90	16.55	41.30	17.16
Paradiddles	36.30	12.20	58.30	5.93
5-Stroke Roll	49.30	9.43	53.80	13.19
Sight-Reading	39.60	15.19	43.20	19.43
<i>Experimental Group</i>				
Eight on a Hand	29.67	14.74	57.00	14.52
FREEZE	26.78	13.77	54.89	8.31
Paradiddles	26.78	25.91	60.67	10.04
5-Stroke Roll	41.56	20.98	62.67	11.60
Sight-Reading	30.11	15.34	57.89	11.91

Table 3

Mann-Whitney U values for Pretest and Posttest

	Pretest	Posttest
<i>Control Group</i>		
Eight on a Hand	26.0	62.0
FREEZE	36.5	68.5
Paradiddles	59.5	49.5
5-Stroke Roll	39.0	60.5
Sight-Reading	32.5	62.5
<i>Experimental Group</i>		
Eight on a Hand	64.0	28.0
FREEZE	53.5	21.5
Paradiddles	30.5	40.5
5-Stroke Roll	51.0	29.5
Sight-Reading	57.5	27.5

Data Analysis of Experimental Group

The effect size of the experimental group was calculated. Effect size was used to show comparison of the experimental and control group's progress since both received similar treatment. Slavin (2007) defined effect size as "the difference between the experimental group's mean and the control group's mean divided by the control group's standard deviation:

$$ES = \frac{M_e - M_c}{S_c}$$

where: ES = effect size

M_e = mean of the experimental group

M_c = mean of the control group

S_c = standard deviation of the control group (p. 280)

Cohen (1977) provided guidelines for interpreting effect size: Small effect size: $d = .2$; medium effect size $d = .5$; and large effect size: $d = .8$. Exercise 8 on a Hand had an effect size of $d = .39$, FREEZE had an effect size of $d = .79$, Paradiddles had an effect size of $d = .40$, 5-Stroke Roll had an effect size of $d = .67$, and Sight-Reading had an effect size of $d = .76$. These findings are outlined in Table 4.

Table 4

Effect Size of Experimental Group (d)

	Effect Size	Effect Size Interpretation
Eight on a Hand	0.39	Small
FREEZE	0.79	Large
Paradiddles	0.40	Small
5-Stroke Roll	0.67	Medium
Sight-Reading	0.76	Large

Both groups showed an increase in mean score from pre- to posttest. The control group increased by 125.98%, while the treatment group increased by 189.22%. The graph in Figure 3 shows the results from Table 2, displaying the scored average increase of the mean and standard deviation from pre- to posttest.

Figure 3. Graphical interpretation of data in Table 2

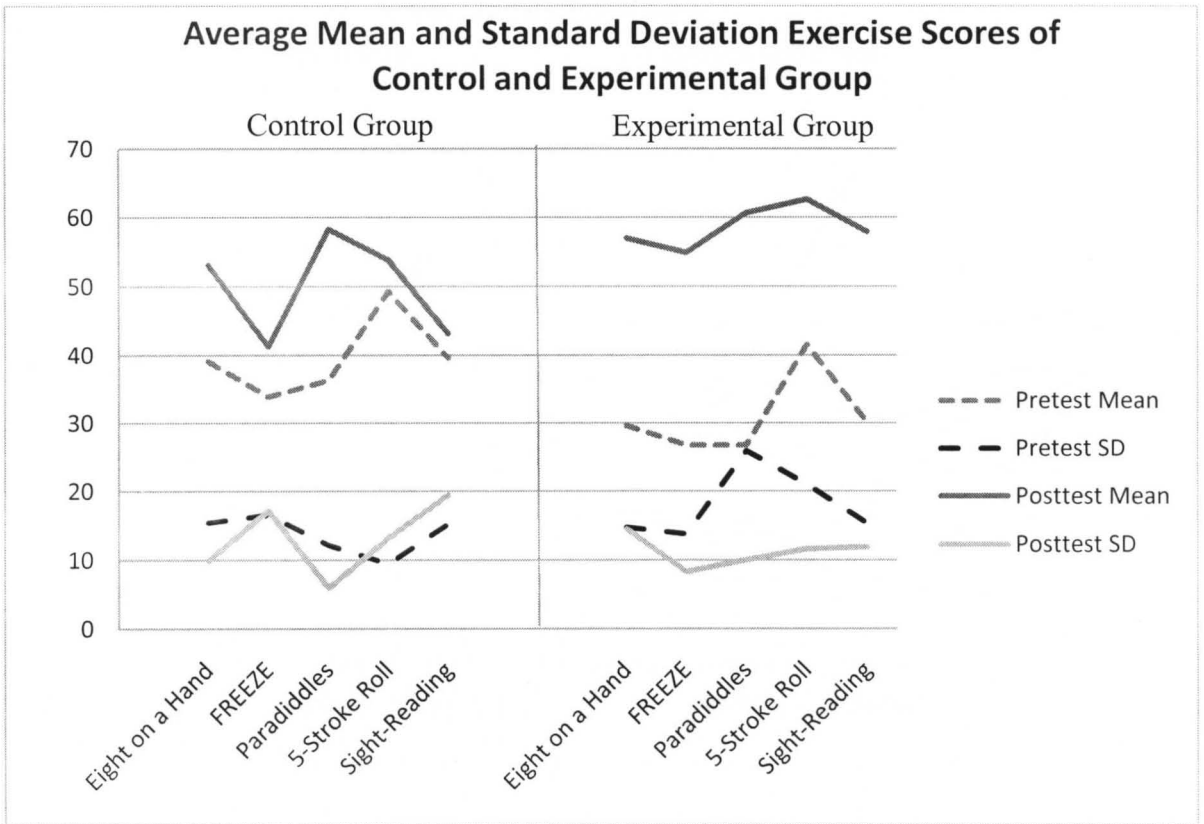
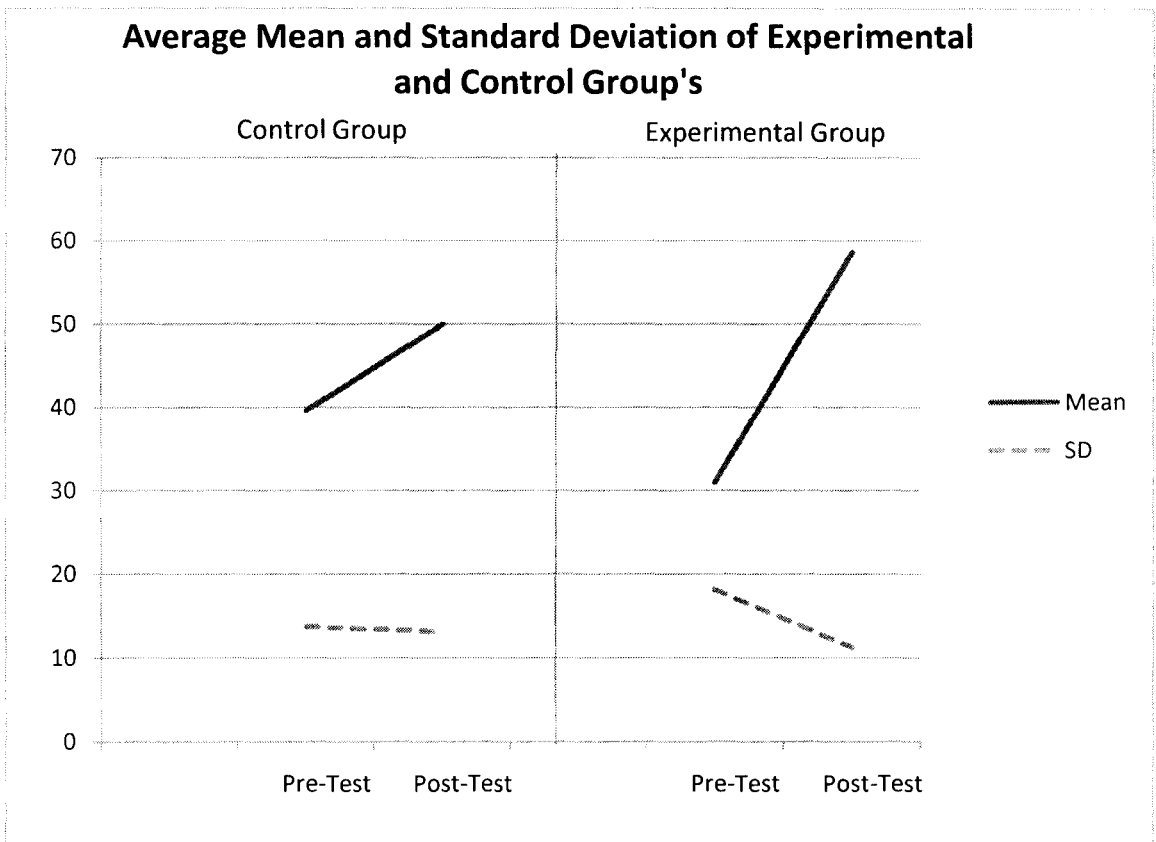


Figure 4 shows the total average of the mean and standard deviation of the control and experimental groups, based on Table 1. Results displayed here show a large increase in the average mean score for the experimental group compared to the control group.

Figure 4. Graphical representation of Table 1



CHAPTER 5

DISCUSSION

There was no statistical significant difference between the experimental and control groups. However, the results did reveal an increase in rhythmic accuracy in both groups, suggesting that practice with either a metronome and/or Beatnik are effective ways to improve rhythmic skills. Although there were no significant differences between groups, the treatment group did receive higher scores on rhythmic accuracy, suggesting that the Beatnik could possibly improve accuracy more so than the use of a metronome. A larger sample size, larger exposure to the use of the Beatnik, and additional music examples are needed to see if similar trends would consistently appear.

The increase of rhythmic accuracy scores in both groups does suggest that a 5-minute practice session is an adequate amount of time for a beginning percussion player to improve rhythm accuracy. It is likely that teachers who want to include the Beatnik as part of their warm-up for percussion students would see an improvement in their students rhythmic accuracy. The increase in rhythmic accuracy not only suggests improvement, but also implies skill improvement in snare drum fundamentals and stroke technique.

The pretest evaluated the participant's ability to play the exercises as scored by the Beatnik. During the pre- posttest, the Paradiddle exercise had the highest difference between standard deviation scores for the experimental and control groups. This is not surprising considering that the exercise had an increase in note value, presenting sixteenth notes versus eighth notes, which require more eye-hand coordination. The

addition of the sixteenth notes created more strokes to be played on the Beatnik, which also allowed for more errors to occur. Another finding was the increase in the Paradiddles mean score from the pretest to posttest. Both groups showed an increase in their mean scores; the control group increased 22 percentage points and the experimental group raised their percentage points by 33.89. The standard deviation scores also decreased substantially from pretest to posttest. The control group's *SD* score decreased by 6.27, and the experimental groups *SD* decreased by 15.87. These results suggest that rhythmic pulse on complicated rhythmic exercises may improve within a three-week period.

It is also interesting to note that the effect size was the highest in the Sight-Reading and FREEZE exercises. The increase in effect size suggests a connection between the various techniques that were being tested. For example, the FREEZE exercise used the downstroke as the primary technique. The downstroke is important for beginning snare drum players because it is the foundation for accented notes on the snare drum. The large effect size reveals a strong development in the participants downstroke beat. Additionally, the Sight-Reading exercise developed the snare drum player's ability to read syncopated patterns on the snare drum. The increase in effect size for this exercise suggests that the ability to sight read syncopated rhythms may improve when using the Beatnik.

The 5-Stroke Roll exercise revealed a medium increase in effect size. Subsequently, the 8 on a hand exercise and the Paradiddles exercise yielded a small effect size. The small effect size for the 8 on a hand and Paradiddles exercises is not surprising. These two exercises represented both the easiest and most difficult exercises

technically. It seems plausible that 8 on a hand yielded a small effect size because playing eighth notes on a practice pad is not technically demanding. Therefore, the effectiveness of the Beatnik was trivial. Likewise, the Paradiddles exercise is technically demanding. These results suggest the Paradiddles exercise was more difficult to improve, also suggesting effectiveness of the Beatnik to be trivial.

Perhaps the most important finding of this study was that a five-minute practice session over 3-weeks revealed increases in rhythmic accuracy of non-percussion music majors. Findings suggest that band and orchestra directors could use the Beatnik as a device for improving their percussion student's rhythm accuracy. Additionally, the researcher hypothesizes that multiple age groups of percussionist might also benefit from the use of the Beatnik to improve technique and accuracy. It could be especially beneficial to use during the opening ensemble warm-up by having a practical routine to help guide their rhythm accuracy.

Research Questions

This study addressed the following three questions:

- 1) Does the Beatnik Rhythmic Analyzer improve the rhythmic accuracy of non-percussion music majors?

Yes – as evidenced by the percentage increase between pre- posttest scores, the large effect size on FREEZE and Sight-Reading exercises, and the increase of mean scores from pre- posttest.

- 2) Are there significant differences between using a metronome verses the Beatnik Rhythmic Analyzer on rhythmic accuracy of non-percussion music majors?

The results from the Mann Whitney *U* test revealed that there was not a significant difference between the control group and the experimental group.

3) Will repeated use of the Beatnik Rhythmic Analyzer improve the rhythmic accuracy over time?

Yes – participants who practiced with the Beatnik Rhythmic Analyzer did improve in rhythmic accuracy more so than the metronome participants.

Future Studies and Additional Comments

Future research may include a larger sample size, replications and different age and/or ability groups. It may also be beneficial to examine other rhythmic analyzers, such as the Roland HPD 10 or Simmons SD1 Electronic Drum Pad. A more in-depth study using the Beatnik’s “History 2” graph on student’s concentration levels of practicing may also generate interesting findings. Exploring different tempos might also reveal further insights into whether or not the findings could be generalized to other settings. Additionally, determining gender or age influences could also be investigated.

The implication or use of technology is only as good as the instructor’s experiences with the technology. It is important for instructors to understand how to plan lessons around the abilities of the technological device, as suggested by Kervin and Vardy (2007) who stated:

... it is imperative for teachers to carefully plan for and facilitate classroom experiences that promote understanding of the technology coupled with curriculum knowledge. The technology needs to support the philosophy of the teacher and be integrated into classroom experiences in ways that contribute to their pedagogical expertise and knowledge of those students. (p. 64)

A percussion instructor has to often use a variety of teaching techniques to help a student learn. Similarly, a school band or orchestra director also needs multiple resources to teach the percussion section during warm-ups and ensemble rehearsal. Music educators and particularly teachers, who work with young percussionists, are frequently looking for effective teaching aids. Given the positive results of the Beatnik Rhythmic Analyzer on developing rhythmic accuracy, it seems that the use of the Beatnik in a rehearsal setting is a viable teaching tool.

REFERENCES

- Bebeua, M. (1982). Effects of traditional and simplified methods of rhythm-reading instruction. *Journal of Research in Music Education*, 30(2), 107-119.
- Beckstead, D. (2001). Will technology transform music education? *Music Educators Journal*, 87(6), 44-49.
- Bissell, P. (1998). Tune in to technology. *Music Educators Journal*, 85(2), 36-41.
- Boisen, R. (1981). The effect of melodic context on students' aural perception of rhythm. *Journal of Research in Music Education*, 29(3), 165-172.
- Bollinger, D. (1979). *Band Director's Complete Handbook*. New York: Parker Publishing Company.
- Boyle, D. (1970). The effect of prescribed rhythmical movements on the ability to read music at sight. *Journal of Research in Music Education*, 18, 307-318.
- Britton, A., Broido, A., & Gary, C. (1968). *Documentary Report of the Tanglewood Symposium*. Music Educators National Conference, Washington, DC, 1968, p.139.
- Burnard, P., & Finney, J. (2007). *Music Education with Digital Technology*. London, England: Continuum International Publishing Group.
- Campbell, P. (2008). *MUSICIAN & TEACHER: An Orientation to Music Education*. New York: W.W Norton & Company.
- Carpenter, R. (1991). *Technology in the Music Classroom*. New York, New York: Alfred Publishing Company.
- Cohen, J. (1977). Effects of conducting-gesture instruction on seventh-grade band students' performance response to conducting emblems. *Journal of Research in Music Education*, 46(3), 360-373.
- Colley, B. (1987). A comparison of syllabic methods for improving rhythm literacy. *Journal of Research in Music Education*. 35(4). 221-235.

- Collins, A., & Halverson, R. (2010). The second educational revolution: rethinking education in the age of technology. *Journal of Computer Assisted Learning*, 26(1), 18-27.
- Colwell, R. (2002). *MENC Handbook of Musical Cognition and Development*. New York: Oxford Press.
- Cook, G. (1988). *Teaching Percussion*. New York: Macmillan.
- Cooper, L. (2004). *Teaching Band & Orchestra: Methods and Materials*. Chicago, Illinois: GIA Publications.
- Deal, J. (1985). Computer-assisted instruction in pitch and rhythm error detection. *Journal of Research in Music Education*, 33(3), 159-166.
- Demorest, S., Serlin, R. (1997). The integration of pitch and rhythm in musical judgment: Testing age-related trends in novice listeners. *Journal of Research in Music Education*, 45(1), 67-79.
- Duke, R. (1989). Effect of melodic rhythm on elementary students' and college undergraduates perceptions of relative tempo. *Journal of Research in Music Education*, 37(4), 246-257.
- Duke, R. (1994) When tempo changes rhythm: the effect of tempo on non-musicians' perception of rhythm. *Journal of Research in Music Education*, 42(1), 27-35.
- Duke, R., Simmons, A., & Cash, C. (2009). It's not how much; it's how characteristics of practice behavior and retention of performance skills. *Journal of Research in Music Education*, 56(4), 310-321.
- Eck, D. (2005). Editorial: New Research in Rhythm Perception and Production. *Music Perception*, 22(3), 365-369.
- Fitch, T., & Rosenfeld, A. (2007). Perception and production of syncopated rhythms. *Music Perception*, 25(1), 43-58.
- Forest, J. (1995). Music technology helps students succeed. *Music Educators Journal*, 81(5), 35-38+48.
- Gembris, H. (2002). "The Development of Musical Abilities". *MENC Handbook of Musical Cognition and Development*, ed. Richard C. New York, New York: Oxford University Press.
- Grant, J.M. (1998) Does Integrating Technology into the Curriculum Increase Student Learning? *ERIC Clearinghouse on Assessment and Evaluation*. ED: 431006

- Hagen, S. (1999, July). "Technology in K-12 Music Instruction: Research Projects and Applications developed at the Center for Music Research" in *1999 National Symposium for Music Instruction Technology: Auburn University July 30-31, 1999*, ed. Walls, K. Auburn: Center for Music Research Press.
- Harrison, C., & Pound, L. (2003). *Supporting Musical Development in the Early Years*. Philadelphia, PA: Open University Press.
- Hill, W., Smith, R., & Horn, M. (2004). *Using Technology to Increase Student Interest, Motivation, and (Perhaps) Learning*. Unpublished manuscript, Center for excellence in teaching and learning, Kennesaw State University, Kennesaw, Georgia.
- Hinckley, J. (1994) *Music at the Middle Level: Building Strong Programs*. Reston, VA: Music Education National Conference.
- Kervin, L., & Vardy, J. (2007). Look Who's Talking: iPods in the Classroom. *Screen Education*, 48, 58-64.
- Kuhn, T., & Gates, E. (2006). Effect of Notational Values, Age, and Example Length on Tempo Performance Accuracy. *Music Education Research: An Anthology from the Journal of Research in Music Education*, ed. Harry E. Price. Reston: Music Educators National Conference.
- Larrick, G. (2006) *An Autobiographical Bibliography of Percussion Music*. New York: The Edwin Mellen Press.
- Lee, H.C. (2006). Automatic Synchronization of Background Music and Motion in Computer Animation. *Eurographics*, 24(3), 353-362.
- Loehr, J., Palmer, C. (2009). Subdividing the beat: auditory and motor contributions to synchronization. *Music Perception*, 26(5), 415-425.
- London, J. (n.d.) Pulse. In *Oxford Music Online*. Retrieved from www.oxfordmusiconline.com
- London, J. (n.d.) Rhythm. In *Oxford Music Online*. Retrieved from www.oxfordmusiconline.com
- London, J. (2002). Cognitive constraints on metric systems: Some observations and hypotheses. *Music Perception*, 19, 529-550.
- London, J. (2004). *Hearing in Time*. New York: Oxford University Press.
- London, J., & Himberg, T., & Cross, I. (2009). The effect of structural and performance factors in the perception of anacrusis. *Music Perception*, 27(2), 103-120.

- Luck, G., & Toiviainen, P. (2006). Ensemble Musicians' Synchronization with Conductors' Gestures: An automated Feature-Extraction Analysis. *Music Perception, 24*(2), 189-200.
- Luck, G., & Sloboda, J. (2009). Spatio-temporal cues for visually mediated synchronization. *Music Perception, 26*(5), 465-473.
- MENC. (1996). *Performance Standards for Music*. Reston: Music Education National Conference.
- MENC. (1998). *Opportunity to learn standards for music technology*. Reston: Music Education National Conference.
- Mckinney, M. (2006). Ambiguity in tempo perception: What draws listeners to different metrical levels? *Music Perception, 24*(2), 155-166.
- Miller, W. (1993). The 25 greatest drum books. *Modern Drummer*, August.
- Moore, R. (1992). Technology for teaching. *Music Educators Journal, 79*(1), 12-13.
- Nelson, D. (1984). The conservation of rhythm in Suzuki violin students: a task validation study. *Journal of Research in Music Education, 32*(1), 25-34.
- New Teacher Standards for Preparation & Certification. (1993). Retrieved from <http://www.kyepsb.net/teacherprep/newteachstandards.asp#std.9>
- Onboard Research Corporation. (2006) Model RA1200p User Guide. Carrollton: OnBoard Research Corporation.
- Placek, R. (1974). Design and trial of a computer-assisted lesson in rhythm. *Journal of Research in Music Education, 22*(1), 13-23.
- Povel, D., & Shumulevich, I. (2000). Measure of temporal pattern complexity. *Journal of New Music Research, 29*(1), 61-69.
- Price, H. (1998). *Music Education Research: An Anthology from the Journal of Research in Music Education*. Reston, VA: Music Educators National Conference.
- Ramsey, D. (1978). Programmed instruction using full-score band literature to teach pitch and rhythm error detection skill to college music education students. *Dissertation Abstracts International, 39*, 4798A-4799A. (University Microfilms No. 7902932)
- Ramsey, D. (1979). Programmed instruction using band literature to teach pitch and rhythm error detection to music education students. *Journal of Research in Music Education, 27*(3), 149-162.

- Rankin, S., Large, E., & Fink, P. (2009). Fractal tempo fluctuation and pulse prediction. *Music Perception, 26*(5), 401-413.
- Reed, Ted. (1958). *Progressive steps to syncopation for the modern drummer*. Alfred Publishing Company.
- Repp, B. (2005). Rate limits of on-beat and off-beat tapping with sample auditory rhythms: 2. The roles of different kinds of accent. *Music Perception, 23*(3), 165-187.
- Repp, B., & Doggett, R. (2007). Tapping to a very slow beat: A comparison of musicians and nonmusicians. *Music Perception, 24*(4), 367-376.
- Repp, B. (2008). Metrical subdivision results in subjective slowing of the beat. *Music Perception, 26*(1), 19-39.
- Roher, D. (2000) Steadiness in instrumental performance: A study of tapping, tempo, and grade. *Journal of Band Research, 36*(1).
- Rudolph, T. (1996). *Teaching Music with Technology*. Chicago, IL: GIA Publications.
- Scholes, P., Nagley, J., & Latham, A. (n.d.) Tempo. In *Oxford Music Online*. Retrieved from www.oxfordmusiconline.com
- Shull, S. & Vande Berg, K. (1994) The Middle School Learner. *Music at the Middle Level: Building Strong Programs*, ed. June Hinckley. Reston: Music Educators National Conference.
- Schulze, H., Cordes, A., & Vorberg, D. (2005). Keeping synchrony while tempo changes: Accelerando and ritardando. *Music Perception, 22*(3), 461-477.
- Slaven, R. (2007). *Educational research: In an age of accountability*. Boston, MA: Pearson.
- Snyder, J., Hannon, E., Large, E., & Christiansen, M. (2006). Synchronization and continuation tapping to complex meters. *Music Perception, 24*(2), 135-146.
- Taylor, D. (2006). Refining learned repertoire for percussion instruments in an elementary setting. *Journal of Research in Music Education, 54*(3), 231-243.
- Trehub, S., & Hannon, E. (2006). Infant music perception: Domain-general or domain-specific mechanisms? *Cognition, 100*, 73-99.
- Walls, K., & Wood, J., & Taylor, J. (1999) *1999 National Symposium for Music Instruction Technology*. Auburn University: CMR Press.

Wang, C. (1984). Effects of some aspects of rhythm on tempo perception. *Journal of Research in Music Education*. 32(3), 169-176.

Windsor, L., & Desain, P. (2000). Introduction: Multiple perspectives on rhythm perception and production. In P. Desain & L. Windsor (Eds.), *Rhythm Perception and production* (p. xi-xvi). Lisse, The Netherlands: Swets & Zeitlinger.

APPENDICES

Appendix A Snare Drum Exercises for Control Group

Snare Drum Exercises

Fundamental Exercises using a metronome

For each exercise, please follow the specific directions listed below. Make sure to start the timer for each exercise, and only play for one minute. Record your score after each exercise played.

Use the metronome and headphones provided for each exercise. The metronome should be on 60 BPM. Concentrate on rhythm, i.e. accuracy, while playing each exercise.

8 on a hand

R R R R R R R R L L L L L L L L R R R R R R R R L L L L L L L L

FREEZE

R R R R R R R R L L L L L L L L L L L L L L

Paradiddles

R L R R L R L L R L R R R L R L L R L R L R R L R L R L L R L R L R R R R L R L R L L

5-Stroke Roll

R R L L R L L R R L L R L L R R L

Appendix B (Page 1)
Snare Drum Exercises for Experimental Group

Snare Drum Exercises

Fundamental Exercises for Beginning Snare Drum

For each exercise, please follow the specific directions listed below. Make sure to start the timer for each exercise, and only play for one minute. Record your score after each exercise is played.

The SKILL level should be set at MEDIUM. To do this, make sure there is an 'M' next to the volume. If not, then hit SKILL > and turn the knob until it says 'M'.

1.) 8 on a hand

BEATNIK SETTINGS - Hit RESET

1.) Hit ANALYZERS > turn knob to DYNAMIC

2.) Hit VIEWS > turn knob to AUTO SW

3.) Hit TEMPO > Turn knob to 60

4.) Hit NOTE/BEAT > Turn knob to '8TH'

5.) Hit START/PAUSE *Start Timer and Begin*

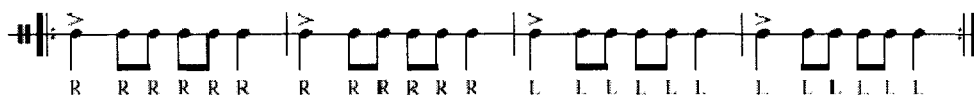


Take note of the middle two dotted lines in the view box which displays the exact tempo.

2.) FREEZE

BEATNIK SETTINGS - Hit RESET

Same as 8 on a hand



3.) Paradiddles

BEATNIK SETTINGS - Hit RESET

- 1.) Hit NOTE/BEAT > Turn knob to '16TH'
- 2.) Hit VIEWS > Turn knob to HISTORY 1

$3/4$ $3/4$ $3/4$ $4/4$

R L R L R L L R L R R L L L R L R L R L R L R L L L R L R L R R L R L R L L

$4/4$

R L R L R L R R L R L R L R L L R L R L R L R R L R L R L L

4.) 5-Stroke Roll

BEATNIK SETTINGS - Hit RESET

- 1.) Hit ANALYZERS > Turn knob to SUB DIV
- 2.) Hit VIEWS > Turn knob to AUTO SW

R R L L R L L R R L R R L L R L L R R L

Appendix C
Sight-reading – Pretest

Sight Reading (Pre-Test)

Snare Drum Exercise

Sight Reading

- 1.) BEATNIK SETTINGS - Hit RESET
- 2.) Hit ANALYZERS > Turn knob to DYNAMIC
- 3.) Hit NOTE/BEAT > Turn knob to '8TH'
- 4.) Hit START/PAUSE > Start timer and begin



Appendix D
Sight-reading – Session 1

Sight Reading (Session 1)

Snare Drum Exercise

Sight Reading

- 1.) BEATNIK SETTINGS - Hit RESET
- 2.) Hit ANALYZERS > Turn knob to DYNAMIC
- 3.) Hit NOTE/BEAT > Turn knob to '8TH'
- 4.) Hit START/PAUSE > Start timer and begin



Appendix E
Sight-reading – Session 2

Sight Reding (Session 2)

Snare Drum Exercise
Sight Reading

- 1.) BEATNIK SETTINGS - Hit RESET
- 2.) Hit ANALYZERS > Turn knob to DYNAMIC
- 3.) Hit NOTE/BEAT > Turn knob to '8TH'
- 4.) Hit START/PAUSE > Start timer and begin



Appendix F
Sight-reading – Session 3

Sight Reading (Session 3)

Snare Drum Exercise

Sight Reading

- 1.) BEATNIK SETTINGS - Hit RESET
- 2.) Hit ANALYZERS > Turn knob to DYNAMIC
- 3.) Hit NOTE/BEAT > Turn knob to '8TH'
- 4.) Hit START/PAUSE > Start timer and begin



Appendix G
Sight-reading – Session 4

Sight Reding (Session 4)

Snare Drum Exercise

Sight Reading

- 1.) BEATNIK SETTINGS - Hit RESET
- 2.) Hit ANALYZERS > Turn knob to DYNAMIC
- 3.) Hit NOTE/BEAT > Turn knob to '8TH'
- 4.) Hit START/PAUSE > Start timer and begin



Appendix H
Sight-reading – Posttest

Sight Reding (Post-Test)

Snare Drum Exercise
Sight Reading

- 1.) BEATNIK SETTINGS - Hit RESET
- 2.) Hit ANALYZERS > Turn knob to DYNAMIC
- 3.) Hit NOTE/BEAT > Turn knob to '8TH'
- 4.) Hit START/PAUSE > Start timer and begin



Appendix I Student Ability Percussion Test

Student Ability Percussion Test

Student Ability Percussion Test

Scoring Criteria

Play First 3 Measures of Paradiddles Exercise

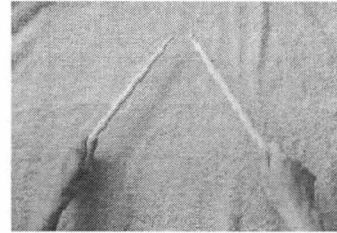
	Poor	Fair	Good	Excellent
1-1				
1-2				
1-3				
1-4				
1-5				
1-6				
1-7				
1-8				
1-9				
1-10				
1-11				
1-12				
1-13				
1-14				
1-15				
1-15				
1-17				
1-18				

Appendix J

Snare Drum Fundamentals Handout

Percussion Methods

Starting a new student on Snare Drum
Fundamental Technique and Ideas



The Grip – Matched Grip

- 1.) Palms are always facing the ground
- 2.) Fulcrum point of grip is between first joint of the first finger and flat or fleshy part of the thumb.
- 3.) Fulcrum should be on one-third from the butt of the stick [Pivot Point]
- 4.) Fingers (pads) are all on the stick [no gap between Thumb and Index Finger]
- 5.) Arms should be close to a 90 degree angle in playing position
- 6.) Wrist movement only, no arm movement

Approaching the Drum

- 1.) Snare Drum should be waist high
- 2.) Beads of the stick should be in the middle of the drum
- 3.) Elbow should be comfortably next to body (Relax and Lift method)
- 4.) TURN THE SNARES ON

Common Mistakes

- 1.) Student points finger(s)
- 2.) Student uses arms to play on the drum
- 3.) Student's distance is too close/far from the drum
- 4.) Playing position is not consistent with the center of the drum
- 5.) Student holds stick too high on the shaft

Practice Exercise #1

This exercise is not meant to be played fast. It is meant to be used as a developing tool for the proper grip to the snare drum. As you practice this exercise, notice all of the points and elements of the grip to ensure the proper technique is being used.

Downstroke – Produced by a full stroke down into the drum, then allowing the stick to stay in center position for successive strokes.

Doubles – Produced by allowing the stick to bounce multiple times, using the drums response. A double can be done by allowing the fingers and wrist motion to follow the doubles.

Appendix K Beatnik – Practice Log

Beatnik Rhythm Analyzer
Practice Log

NAME _____ Student No. _____

	Date	Exercise	Tempo	Length of Time	Skill	Score
Practice Session ---1---		8 on a hand	60 BPM	1 minute	Medium	
		FREEZE	60 BPM	1 minute	Medium	
		Paradiddles	60 BPM	1 minute	Medium	
		5-Stroke Roll	60 BPM	1 minute	Medium	
		Sight Reading	60 BPM	1 minute	Medium	
Practice Session ---2---		8 on a hand	60 BPM	1 minute	Medium	
		FREEZE	60 BPM	1 minute	Medium	
		Paradiddles	60 BPM	1 minute	Medium	
		5-Stroke Roll	60 BPM	1 minute	Medium	
		Sight Reading	60 BPM	1 minute	Medium	
Practice Session ---3---		8 on a hand	60 BPM	1 minute	Medium	
		FREEZE	60 BPM	1 minute	Medium	
		Paradiddles	60 BPM	1 minute	Medium	
		5-Stroke Roll	60 BPM	1 minute	Medium	
		Sight Reading	60 BPM	1 minute	Medium	
Practice Session ---4---		8 on a hand	60 BPM	1 minute	Medium	
		FREEZE	60 BPM	1 minute	Medium	
		Paradiddles	60 BPM	1 minute	Medium	
		5-Stroke Roll	60 BPM	1 minute	Medium	
		Sight Reading	60 BPM	1 minute	Medium	

CURRICULUM VITAE

Name: Aaron P. Klausung

Birthplace: Lexington, KY

Birth year: June 10th, 1981

Higher Education: University of Louisville
Louisville, Kentucky
Degree: Masters of Music Education (2010)

University of Kentucky
Lexington, Kentucky
Major: Music Education
Degree: Bachelors of Music in Music
Education (2004)

Experience: University of Louisville
Louisville, Kentucky
2009-2010
Percussion Methods Teacher

Louisville Leopard Percussionist
Louisville, Kentucky
2008-2010
Assistant Teacher & Arranger

Beaumont Middle & Dunbar High School
Lexington, KY
2004
Student Teaching