THE EFFECT OF SINGING INSTRUCTION ON TONE QUALITY AND INTONATION OF BEGINNING BRASS PLAYERS

by

CARA ANNE MORANTZ

(Under the Direction of Mary Leglar)

ABSTRACT

The purpose of this study was to determine whether beginning brass students who engaged in singing movable *do* solfege tonal patterns, prior to performing those patterns on instruments, developed a more discriminatory sense of pitch, improved tone quality, and better intonation than those who did not. Using a Control/ Treatment Group Experimental design, three research questions were addressed: (1) Did singing movable *do* solfege tonal patterns, prior to performing those patterns on instruments, improve students' discriminatory sense of pitch? (2) Did singing movable do solfege tonal patterns with pure and resonant vowel shapes, prior to performing those patterns on instruments, improve the purity and resonance of tone quality of beginning brass players? (3) Did singing movable *do* solfege tonal patterns, prior to performing those patterns on instruments, improve the intonation of beginning brass players?

Thirty-six middle school students in the southeast portion of the country participated. The subjects were sixth-grade volunteers registered for beginning band class. Each subject was learning to play a brass instrument—trumpet, trombone, euphonium, or tuba. The students were

divided into two statistically equal groups based on results of the Selmer Music Guidance Survey for Pitch (SMGSP). During the six-week experiment, both groups received traditional method book instruction from the school band director. In addition, the experimental group received singing instruction on movable *do* solfege tonal patterns. At the end of the six-week period, both groups repeated the SMGSP and recorded a line from the method book that all had equal experience performing.

On the pretest-posttest SMGSP, students were graded for accuracy by listening to pairs of tones (sixteen items) and indicating whether the second pitch was the same, higher, or lower than the first. The results indicated that although the experimental group performed better than the control group, the difference was not significant. Pretest scores and gender had a significant effect on the results of the posttest.

While females in the treatment group had the highest average scores for tone, an examination of the scores from each group failed to yield statistical significance. Likewise, an examination of the posttest scores for intonation between the control and treatment groups was not statistically significant.

In conclusion, the research indicates that singing instruction has neither a positive nor a negative impact on instrumental tone quality and intonation, but suggests that singing may be beneficial in improving pitch discrimination.

INDEX WORDS: Singing instruction, instrumental, brass players, tone quality, intonation

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CARA ANNE MORANTZ

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CARA ANNE MORANTZ

Major Professor: Mary Leglar
Committee: Roy Kennedy
Stephen Valdez

Electronic Version Approved:

Suzanne Barbour
Dean of the Graduate School
The University of Georgia
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CHAPTER 1

INTRODUCTION

For most children, music education begins long before they enter school, with singing. General music curricula build on that natural foundation by using singing to develop musical skill and conceptual knowledge. Why, then, do music educators often abandon that foundation when students move into the instrumental music classroom? According to LaPointe Davis:

> Singing is seldom included as part of elementary band instruction while it is an integral part of the musical learning process in elementary general music class. It is recognized that singing can help develop knowledge and understanding of melody, harmony, rhythm, and form. This can be an advantage for students to gain musical understanding without being encumbered by the instrument. (1981, p. 1)

In contemporary beginning band classes, it is common practice to begin instruction using a method book. With this approach, students are first introduced to instrument assembly, posture, hand position, and embouchure formation; then they proceed to performing the first note. At this time, students are presented with a notational symbol, the corresponding fingering, key, or slide position for their instrument, and are then expected to produce the pitch. This approach implies that mechanical accuracy can compensate to some extent for inability to hear pitches. According to Elliot (1974):

> Wind instrumentalists can rely on pressing keys or valves while the string player controls every variation of pitch with their finger and hearing sensitivity. Therefore, a keen sense of hearing is not absolutely necessary in the production of tones for most wind instruments. (p. 121)

Need for the Study

The Pestalozzian principle of sound before symbol has shaped many of the current underlying philosophies of music education (Kohut, 1973). While this principle is widely accepted in the general and choral music curriculum, instrumental classes for beginners do not typically incorporate it in their instruction.

Singing prior to performing on instruments allows students to focus on their aural sense without being encumbered by operating the mechanics of their instrument. Producing clear sounds also benefits students when the added responsibility of reading notation is introduced. A good educator is aware of the need to account for student readiness. It would have a positive impact on performance if students already possessed the skill to perform a beautiful sounding pitch prior to being asked to decode the symbol that represents that pitch on the staff. This system would not only aid the student in producing a more clear, pure, and centered sound, but might also lessen the anxiety often associated with the beginning reading process.

Historically it has been proven that singing has a positive impact on instrumental musicians, however, those findings have yet to cause any substantial change in beginning instrumental pedagogy. Instructors tend to teach the way that they were taught, and this and other reasons are presented to explain why singing or a solfege approach to beginning wind instrument instruction is still so rare. Dunlap (1989) says

> Many teachers describe limited time as a reason for not employing the voice during class. Second, teachers believe the methods they currently use are effective and don't see the need for singing. The third reason is that many instrumental teachers are unsure of how to implement the vocalization instruction. It is also possible that some do not have the skills necessary to use such a system. (p. 12)

Purpose of the Study

In this study, the mechanics-first approach was reversed: students initially engaged in singing tonal patterns, using the movable *do* solfege system, and subsequently learned to reproduce those patterns on their instruments. Solfege syllables were chosen because they provide a common language all instruments can use regardless of transposition. Performing the pitches and patterns first vocally allows the students to transfer that knowledge and skill to their instrument without the additional responsibility of reading notation, which inevitably takes some of their attention away from the sound they produce.

The purpose of this study was to determine whether beginning brass students who sang tonal patterns, using the movable *do* solfege system, prior to performing those patterns on instruments would develop a more discriminatory sense of pitch, improved tone quality, and better intonation than those who did not. The following research questions guided the study:

1. Does singing tonal patterns, using the movable *do* solfege syterm, prior to performing those patterns on instruments improve students' discriminatory sense of pitch?

2. Does singing tonal patterns, using the movable *do* solfege system, with pure and resonant vowel shapes, prior to performing those patterns on instruments, improve the purity and resonance of tone quality of beginning brass players?
3. Does singing tonal patterns, using the movable *do* solfege system, prior to performing those patterns on instruments improve the intonation of beginning brass players?

Delimitations

The study was delimited to 6th grade brass (trumpet, trombone, euphonium, tuba) band students (*N*= 36) from one middle school in the southeastern United States. The experimental treatment was delimited to three 20-minute lessons per week for a six-week period (18 sessions). It was discussed how to most appropriately measure intonation. Considerations were given to input each piece of data into recording software, which could measure the exact frequencies the students performed. During consultation, the argument was presented that no piece of technology compares to the human ear. After much research on acquiring the technology required to measure by computer, it was decided to use three live judges to measure the intonation accuracy of each recording.

Methodology

The study employed a pretest-posttest experimental design. The sample population consisted of one 6th grade class of beginning brass students (*N*=36) from one middle school located in the southeastern United States. Students were divided into a control group and a treatment group. In order to ensure that data collected did not reflect unequal musical aptitude between control and treatment groups, the *Selmer Musical Aptitude Pitch Test* (*SMAPT*) was administered to all the students. Subjects in each

instrument section (trumpet, trombone, euphonium, and tuba) were ordered according to test score. For the students with ranks 1 and 2, one was randomly assigned to the control group and the other to the treatment group. The same process was employed for students with the ranks of 3 and 4, 5 and 6, etc.

The study was conducted over a period of six weeks. The researcher administered the three times per week for 20 minutes at the beginning of each class period. The activity of students in the treatment group consisted of singing tonal patterns using the moveable *do* system, before performing those same patterns on instruments. The control group received traditional method-book instruction from the band director. At the end of the six-week treatment period, students from both groups were recorded individually performing a line from the method book, which all had equal experience in playing. In addition, both groups performed the selected line from the method book as an ensemble..

For the response variables tone quality and intonation, a panel of three experts evaluated each of the students' recordings, assigning a score on a 1-5 scale (where higher is better) for each variable. To ensure inter-rater reliability, judges were trained in advance. Fleiss' Kappa statistics was used to measure inter-rater reliability.

The response variable pitch discrimination was measured by scores received on the *SMAPT*, which was administered as both a pretest and a posttest. The posttest score was the actual response variable used to measure pitch discrimination.

All three response variables (tone quality, intonation, and pitch discrimination) were subjected to an ANOVA to determine significant difference in the mean scores obtained by the students in the control and treatment groups.

Definition of Terms

For the purposes of this study, the following terms were defined as follows.

1. Singing tonal patterns: Subjects sing by rote through use of movable *do* solfege syllables, including scales, tonal patterns, intervals, and melodies. Researcher sings tonal patterns using solfege, subjects imitate. Researcher performs patterns on an instrument, subjects sing using the solfege syllables for the pattern they hear. Researcher sings solfege tonal patterns, subjects perform patterns on their instrument.
2. Instrumental music performance: Brass students playing their instruments (trumpet, trombone, euphonium, and tuba). For assessment purposes, brass subjects playing prepared music on their instrument and for evaluation of performance elements by a panel of experts.
3. Discriminatory sense of pitch: The ability to discern whether pitches move up, down, or stay the same.
4. Intonation: The degree of pitch accuracy in a single tone. Intonation may be in tune, flat, or sharp.
5. Musical aptitude: The standardized measure of a student's potential to achieve in music as measured by the *SMAPT*.

Organization of the Study

The study is organized as follows.

Chapter 1. Introduction and Overview

Chapter 2. Related Literature

CHAPTER 2

RELATED LITERATURE

Introduction

The purpose of this study is to determine whether beginning brass students who engage in singing movable *do* solfege tonal patterns, prior to performing those patterns on instruments, will develop improved tone quality, a more discriminatory sense of pitch, and better intonation than those who did not. The belief that singing is related and beneficial to instrumental performance is a popular one. Various sources suggest that singing is an effective technique to enhance instrumental music instruction (Robinson, 1996; Dalby, 1999; Wolbers, 2002). Authors have also written on various aspects of musical performance for which singing may cause improvement such as sight-reading ability, intonation, and melodic accuracy (Grutzmacher, 1987; Dunlap, 1989; Garofalo, 1996).

This chapter presents a review of the literature (including books, dissertations, and scholarly journal articles) that informed this study. The sources reviewed are divided according to the topics investigated, as follows: 1) the effect of singing on musical achievement, 2) the effect of singing on intonation, 3) the effect of singing on instrumental sight-reading, 4) audiation, and 5) incorporating singing into the instrumental classroom. Studies are presented in chronological order of publishing date.

Effect of Singing on Musical Achievement

In 1981, Davis researched the effects of structured singing activities on the

development of instrumental performance skills among elementary band students. Davis acknowledges the benefits of vocalization in "that singing can help develop knowledge and understanding of melody, harmony, rhythm, and form. This can be an advantage for students to gain musical understanding without being encumbered by the instrument." (p. 1). With respect to instrumental performance, Davis concluded that structured singing activities provide a significantly effective approach to the development of instrumental performance skills, particularly during the first year of instruction (1981).

Dunlap begins his 1989 dissertation with a quote from Kodaly: "to teach instrumental music without first developing singing is to build upon sand" (p. 1). It was determined that engaging in vocal activities for part of the instructional time did not adversely affect the experimental group students' instrumental performance skills. There were no significant differences in technical criteria or musical criteria scores between groups in Dunlap's study despite the fact that students in the experimental group played their instruments less to allow for the inclusion of the singing activities (Dunlap, 1989).

Krusback (2006) looked at methods of teaching that could have a positive impact on the performance achievement of their students. Results from pre- and poststudy questionnaires revealed that, after having had this singing experience related to their instruments, the students in Krusback's study had a more positive attitude toward singing. In addition, a majority of students agreed that singing exercises helped them perform better on the instrumental etude and that after being a part of the study they were more inclined to use their singing voices as they practice (Krusback, 2006).

Beckman (2014) states that singing has always been integral to all aspects of music education including instrumental music. He conducted a study to examine the use

of audiation on the melodic error detection ability of elementary instrumentalists. Beckman includes recent trends in education in teaching instrumental music to children. One of these trends is teaching young instrumentalists to read music notation from the very first lesson. Perhaps this has been made popular because most current method books commonly used today are based on this type of instruction. A notation-based approach teaches notes and rhythms one at a time. It would seem that notation and technical skills are taught at the expense of developing students' aural skills. Although conclusions in a number of other studies show that singing is an effective instructional technique, the results of this particular study showed singing not to be significantly effective in developing students' ability to detect melodic errors.

Effect of Singing on Intonation

The ability to perform in tune is one of the primary concerns in both ensemble and individual music performance. While it is agreed upon that this is a priority for students of all ages, it is a difficult task to achieve. Garofalo states in his 1996 book *Improving Intonation in Band and Orchestra Performance*:

> If you want to develop a musically expressive performing ensemble that plays in tune, do it the old fashioned way - teach your band or orchestra how to sing. Singing is without questions the single most powerful way to develop good intonation and musical expression. (p. 75)

Yarborough, Karrick, and Morrison (1995) investigated the effect of knowledge of directional mistunings on the tuning accuracy of beginning and intermediate wind players. Data demonstrated that only years of instruction significantly affected subjects' tuning accuracy. There were no significant differences due to treatment, instrument type,

or tuning pitch. Finally, there was consistent improvement from the first to the fourth year in both perception and performance tuning tasks.

String players lack the pistons and keys to make pitch matching an easier task. Dell (2003) sought to determine the effects of singing and tonal pattern instruction on the accuracy of intonation performance skills of beginning string students. The results indicated that students taught using Aural-Based and Aural-Based with Tonal Pattern Enhancement instruction performed with a greater intonation accuracy than those taught using Notation-Based instruction. Thus providing strong evidence to support that singing and aural skills improve instrumental performance (Dell 2003).

Latten (2005) acknowledged the previous research regarding pedagogy of intonation. While specific skills and portions of organized sequences regarding intonation have been discussed, no complete list or sequence has been presented. The results of Latten's work produced an order in which intonation skills might effectively be introduced to student musicians. Utilizing sight singing, solfege, and ear training were noted as techniques that can improve intonation. In the researcher's opinion, the skills, singing and humming and, recognizing acoustical beating, could be trained to a very high level of proficiency through general music instruction, prior to the start of instrumental training (Latten, 2005).

Mora's (2007) study investigated the effects of melodic tonal pattern imitation on intonation of sixth-grade instrumental music students. One band class and one orchestra class received treatment while a separate band and a separate orchestra class served as the control. Treatment consisted of the use of tonal patterns during daily warm-up activities. Results of the Independent Sample *t* test showed the band treatment group scored

significantly higher on intonation than the band control group. Results also indicated that there was no statistical significance between the orchestral treatment and control. When comparing means, however, the orchestra treatment group scored higher on intonation than the orchestra control group. These findings suggest that the use of tonal patterns in daily warm-up activities have a positive effect on intonation of sixth grade band and orchestra students (Mora, 2007).

Intonation perception studies have generally shown a correlation between singing and aural skills. Most recently, in Mattingly's (2012) research study, the effect of listening to and singing a tuning pitch is measured in relation to a flute player's intonation. The investigation determined if the two variables of hearing and singing had an effect on playing a single pitch in tune on the flute. The results of the study were not statistically significant (Mattingly, 2012).

Effect of Singing on Sight-Reading

Of the studies that address the effect of singing on musical instrumental performance, perhaps the most research has been done on the impact on sight-reading. Successful reading and literacy is one of the primary goals of music education. The rote approaches that can improve the visual processing of music notation are particularly informative. Grande (1976) compares the traditional music reading approach and the "rote-to-note" approach of Alyn Heim in teaching beginning instrumental music. The method is largely based on Edwin Gordon's philosophy, which uses aural skills before symbol and notation are introduced for music reading. Although the experimental groups' scores were higher than the control groups', the results were not significant (Grande, 1976).

Sense of tonality involves aural perception, which Gordon has described as the ability to aurally perceive the relationship of tones within a harmonic framework. It would appear that tonal concept development involves the building of a tonal pattern vocabulary through aural perception, emphasis on improving the ability to aurally perceive tonal relationship within harmonic frameworks, and the improvement of audiation skills. Grutzmacher's (1987) study provides insight into how singing tonal patterns can develop relationships within a melody that can be transferred to the instrument. Grutzmacher investigated the relationship of tonal pattern instruction using harmonization and vocalization on tonal concept development and the performance achievement of beginning wind instrumentalists. Results of the study indicated that instruction using tonal pattern content improves the melodic sight-reading skills of beginning band students significantly more than a traditional method in which notes are individually identified directly from notation and without harmonization and vocalization activities (Grutzmacher, 1987).

Listening, singing, and silent analysis are all common practice strategies that musicians use to help themselves or others master a piece of music. Modeling is one of the most basic direct teaching techniques. Listening to a composition prior to performance, whether using a recorded version or hearing a teacher sing it, is helpful on many levels of musical execution. Rosenthal, Wilson, Evans, and Greenwalt (1988) examined the relative effects of five practice conditions on instrumentalists' performance of a musical composition. The authors found significant differences among the practice techniques in subjects' performance of correct rhythms, phrasing or dynamics, and tempo and non-significant differences among subjects' performances of correct notes and

articulation. Further analysis demonstrated that modeling and practice were most effective in facilitating mastery of the selection. Singing and silent analysis were, in general, no more effective than sight-reading, with the exception of subjects in the silent analysis group, who were more accurate in their performance of the rhythms of the selection.

A study by Bernhard (2003) reviewed research literature on the use of vocalization as an instructional tool in instrumental music education, featuring studies of tonal-verbal vocalization methods. The purpose was to examine relationships between tonal aptitude, years of experience with different instruments, years of vocal experience, melodic ear playing, and sight-reading achievement. The results provided evidence that vocal tonal training may positively contribute to beginning wind instrumentalists' melodic ear playing without deterring the development of melodic sight-reading achievement.

Galyen (2005) stated that sight-reading plays a fundamental role in developing independent learners in music. The development of sight-reading skills can suffer if all rehearsal time is devoted to preparation for performances. A wealth of research has been done in the area of music sight-reading. Galyen's article provided a review of the literature on this topic and offer suggestions for applying the findings to current educational settings.

Studies have examined various teaching methods and their effects on the development of sight-reading skills. Of specific interest are the several ways in which vocalization techniques can be used in teaching instrumental music. Results differ in terms of the effects of singing on the sight-reading achievement of instrumentalists.

Research tends to focus on the vocalization tonal patterns as well as Kodaly methods involving singing solfege syllables. Several studies indicate that these techniques have no significant effect on sight-reading ability (Bernhard, 2003; Dunlap, 1990; Mann, 1991). Vocalization activities may be more effective in improving the sight-reading abilities of younger and less experienced musicians (Mann, 1991) and may help improve melodic ear playing ability (Bernhard, 2003). However, the results of Grutzmacher's (1987) study suggest that tonal-concept development may improve melodic sight-reading skills more than traditional or technical skill development.

Audiation

Edwin Gordon coined the term "audiation" in 1975. It refers to the ability to hear sound in one's mind that is not physically present.

> The power of audiation is best understood through analogy. Audiation is to music what thought is to language. When students learn to audiate and perform music as a result of sequential music guidance and instruction, they develop a sense of ownership because they have acquired an understanding of music. It is no different from processes they pursue as they learn to think in words and communicate through speech. (p. ix)

This is crucial to the argument that singing can lead to positive effects on beginning brass students. The ownership students feel as a result of singing allow them to perform with confidence, producing improved sound quality and center of pitch.

Daniel Kohut's book *Instrumental Music Pedagogy*: *Teaching Techniques for School Band and Orchestra Directors* (1973) discusses practical issues directly related to instrumental music teaching:

> Singers have no mechanical means for approximating their pitch and have to rely entirely upon the ear; consequently, they have to develop a good sense of relative pitch and this usually involves considerable time and effort. The latter also applies to instrumentalists. Like other fundamentals of performance, relative pitch should be introduced as soon as the student has a need for it. The need arises as soon as the student begins reading music. He needs to learn to hear with the eye so that he can learn to reproduce written pitches with reasonable accuracy. (p. 31)

Just as singers have no mechanical means for approximating pitch, brass players are limited. While the first pages of a method book introduce pitch symbols associated with finger combinations or slide positions, these fingerings can produce several different sounds. Therefore, audiation may be beneficial to beginning brass students.

Research by Elliot in 1974 indicates that wind instrumentalists are deficient in pitch acuity when compared to other musicians such as vocalists, pianists, and string players. Reasons for the disparity include the size of band classes being rather large, forcing the teacher to focus on mechanical aspects of performance such as correct fingerings, embouchures, and hand positions. The purpose of Elliot's study was to determine the effect of vocalization on the sense of pitch of students in selected beginning band classes. The posttest given to all groups at the end of the year revealed that: 1) Regular participation in band class resulted in improved pitch discrimination and tonal memory abilities. 2) Regular practice in vocalization during band class had a significant effect on the sense of pitch. 3) Brass and woodwind players were affected equally by the vocalization procedure. 4) Private piano study was a factor in the posttest

results, especially on the test where subjects had to match musical sounds with notation. 5) Regular participation in an extracurricular vocal ensemble had little effect on posttest results.

Frierson-Campbell looked at how audiation-based instruction impacts instrumental students with the experience of one year of study. The purpose of this research was to develop and to examine supplementary curricula designed to improve the achievement of second-year elementary instrumental music students. On the basis of the data obtained in this study, it cannot be concluded that there is a relationship between audiation-based enrichment activities and the music achievement of second-year instrumental music students. However, it can be concluded that there is a direct relationship between the music aptitude and the music achievement of second year instrumental music students (Frierson-Campbell, 2000).

The literature consistently reinforces audiation as an essential skill for musicians. No results show a decrease in pitch awareness as a result of singing. It can be concluded that audiation only provides benefits with respect to pitch sensitivity, even though several studies reviewed by Frierson-Campbell did not yield significant statistical results. The beginning stages of instrumental performance are of most interest to the current study. Past research supports the prospect for bridging the gap to instrumental music with an instrument students are already familiar, the voice.

Incorporating Singing into the Instrumental Classroom

The final section of literature review is devoted to authors who have written about techniques and strategies for incorporating singing into instrumental instruction. Robinson (1996) states that introducing vocalization techniques at the beginning of band

or orchestra rehearsals can improve musical and critical-thinking skills of young musicians. Directors express three popular reasons for not utilizing singing in their rehearsals. The first is a concern for taking up valuable instructional time on non-performance oriented objectives. Another area in which singing can conserve time is tuning. Many directors spend significant amounts of time and energy tuning by matching a single pitch, but the goal may be realized quicker by incorporating students singing musical patterns (tonic and dominant) to become more aware of pitch discrepancies. Some teachers lack confidence in their own ability to sing and do not use the method for that reason. However, being willing to accept one's own inevitable errors may foster an environment where students too, can be free to make mistakes. Lastly, teachers fear how students will react to singing. For those uncomfortable singing open-mouthed, humming is an effective modification. Research studies suggest that instrumental students would benefit from vocalization strategies in the rehearsal, with the potential advantages of more accurate intonation, superior instrumental skills, increased sight-reading ability, and improved attitude (Robinson, 1996).

Suggested activities for incorporating singing in the band class include singing a melody that is already familiar. Another way to use singing to teach general music concepts is to have students sing familiar songs in different tonalities or meters. This sequence of activities can conclude by having students play the tune, which is being studied, and then ask the following questions about the music:

1. How many of you played the melody during the song?
2. Who played a countermelody or bass line?
3. How many times was the melody repeated in the song?

4. Was the melody always in the same key?
5. Was the melody ever played with different accompaniments?
6. Were different versions of the melody played in the piece? (p. 21).

Students who are able to answer these kinds of questions are engaged in a deeper form of musical understanding then those who merely learn to play correct notes and rhythms. It can be argued that instrumental teachers who overcome their reluctance to incorporate singing activities in the rehearsal setting provide students with more efficient and enjoyable music learning experiences (Robinson, 1996).

In his 1999 *Music Journal* article, Bruce Dalby talks about a step-by-step process for incorporating audiation into instrumental music instruction. Singing to improve intonation and phrase shaping is the first cited benefit for instrumentalists using their voices. Singing allows the player to focus on the pitch without the mechanical demands or limitations of their instruments. Postponing reading for beginning instrumentalists is another easy step that can benefit a musician for a lifetime. The author relates the example to speech in the way that we would never teach a child to read a language before they were able to think and speak it. Music should be thought of in the same way. Students should strive to learn familiar tunes on their instruments before learning to read. This is an essential skill for connecting audiation to the physical manipulation of the instrument.

Establishing tonal and rhythmic context will provide students with more musical meaning. Just as the meaning of a word is affected by the sentence in which it occurs, so is context critical to the audiation of musical elements. A tonal center can be established by playing the I-V-I chords on a keyboard. Or the teacher can sing a pattern of solfege to

help establish tonal center. It can be a good idea to establish tonality at beginnings, ends, and points of modulation in order to help students understand where the tonality is going in relation to where it has been (Dalby, 1999).

Mark Wolbers is the clarinet professor and wind ensemble conductor at the University of Alaska-Anchorage. He points out that the National Standards for Music Education emphasize both singing and playing instruments, however the use of the singing voice in class is often overlooked. Vocalization in the band class can help students develop aural skills. When properly guided, singing helps to develop aural perception and provides an alternative to a button-pushing mentality. This frame of mind suggests that playing in tune only requires the instrument be at the right length while depressing the right keys or valves. Students must be taught to hear the music and not just to see it (Wolbers, 2002).

Wolbers states it is best to start singing with beginners. The longer one waits, the more self-conscious students become. Perhaps the easiest approach with beginning band students is to have them sing exercises from their method books before playing them. A solfeggio movable-do system has the advantage of consistent harmonic and melodic function while making use of pure Italian vowels, which help foster a beautiful singing tone. Moveable-do also allows all students to sing the same syllables regardless of their instrument key or transposition.

Singing a part can allow players to become acquainted with the intervals of the line. Conceptualizing and hearing intervals before playing them can greatly assist brass players with note accuracy and both brass and woodwind players with intonation. Unlike string players, wind instruments do not benefit from the natural inflections of the bow.

Consequently, wind players can fall into producing a mechanical performance of notes with little or no regard for phrase shape, inflection, or direction. Directors can challenge students to explore the options for expressive playing (Wolbers, 2002).

An interview with Todd Zimbelman, director of band at West Salem High School located in Oregon, highlights his thoughts of what specific techniques can be attributed to the success of his band programs. His use of extensive solfege practice in his band instruction is particularly of interest. Zimbelman breaks down pitch and rhythmic concepts separately. He uses movabe do solfege in his classes for scales, melodic patterns, articulation exercises, chords, and chorales. He has found over the years that it helps raise a group's sense of intonation and pitch awareness as well as their ability to hear music, and their ability with intervallic tuning. Choosing appropriate music to support the development of fundamentals is important to Zimbelman's system. Zimbelman also focuses on the general elements of music so as to produce students who understand form, harmony, cadence points, expressiveness and phrasing. He wants his students to be able to make decisions about the music through having an understanding of musical concepts and their basic application (Zimbelman, 2014).

Chad West is an assistant professor of music education at Ithaca College. His early career was so focused on teaching music notation reading and instrument technique that his students often missed the internal musicianship skills that truly enabled high-level music-making. He offers activities for developing beginning instrumental students' abilities in three areas of musicianship: rhythmic ability, tonal ability, and creativity.

According to West (2015), Edwin Gordon makes the distinction between executive skills and audiation skills. 1) Executive skills are the skills involved in

physically manipulating the instrument (posture, hand position, range, facility, breath support, embouchure, tone production, etc.), often referred to as "technique." Music educators generally do a good job developing these skills in our students, probably because so much time in college method courses was devoted to learning how to play and teach secondary instruments. But, in an attempt to equip students with the myriad of executive skills, audiation skills (the ability to hear and comprehend in one's mind sounds that are not physically present) can be overlooked. West now conceptualizes music teaching in terms of developing five distinct areas of musicianship, which he named "The Big 5." It consists of rhythmic ability, tonal ability, executive skills, notation-reading ability, and creativity. Since directors handle executive skills and notation fairly well, West focuses on the three more underdeveloped areas of instruction.

Essential to the development of tonal ability is the ability to match pitch by manipulating the voice. Another activity to begin differentiating pitch is to play three diatonic notes such as Bb, C, D and teach students to associate the pitches with low, middle and high. Perform them in different sequences and ask them to label the orders in which you played. Another technique to establish tonality is to sing a tune and stop at various places where students must sing the tonic. This activity is aimed at helping students to audiate the tonality and key in relation to the melody, leading to improved intonation when performing (West, 2015).

The review of related literature reinforces the argument that singing dramatically enhances instrumental music instruction. Especially for beginners who may not have literacy skills in their background, some experience performing pitches accurately should be attained prior to notational training. This approach will serve students aurally and

visually. Certainly, more research is needed on this topic in terms of techniques that are most proven successful for beginning wind players. In addition, there is no previous research addressing the benefits of singing or tonal pattern training on brass players exclusively. This study will continue to examine the effectiveness of singing with wind instrumentalists, specifically as it relates to brass players' tone production.

CHAPTER 3

METHODOLOGY

The purpose of this study was to determine whether beginning brass students who sang tonal patterns, using the movable *do* solfege system, prior to performing those patterns on instruments would develop a more discriminatory sense of pitch, improved tone quality, and better intonation than those who did not.

The study used a control/treatment group experimental design. Subjects for the study were volunteer students enrolled in a sixth-grade band class at one middle school. The original participant pool numbered 39, but normal attrition such as moving and schedule changes reduced the final *N* to 36. Participating students completed a Minor Assent Form and returned a signed Parent Permission Form. Copies of these forms, together with the Recruitment Statement, can be found in Appendices C-E.

To ensure that control and treatment groups contained students of comparable musical aptitude, the *Selmer Musical Aptitude Pitch Test* (*SMAPT*) was given to all participants. Within each instrument section (trumpet, trombone, euphonium, and tuba), students were ranked according to test score. Of the students with ranks 1 and 2, one was randomly assigned to the control group and the other to the treatment group. Assignments were made through a coin toss. The same process was employed for students with the ranks of 3 and 4, 5 and 6, etc.

The study period was six weeks, during which the treatment was administered by the researcher three times per week for 20 minutes at the beginning of each class period. Students in the treatment group sang selected tonal patterns before performing the same patterns on instruments (see Appendix F). The control group received traditional method book instruction from the school band directors. At the end of the treatment period, students from both the groups were recorded individually performing a line from the method book, with which they were all equally familiar. In addition, each group performed the same line as an ensemble. All individual and ensemble performances were recorded with a handheld Zoom Digital Recorder.

A panel of three experts evaluated each of the students' recordings, assigning a score on a 1-5 scale (where higher is better) for each of two variables, tone quality and intonation. Prior to rating the performances, judges were given examples of how scores should be assigned and provided with the opportunity to practice assigning scores. Examples of each criterion level were played for the judges, who then practiced rating sample lines from the method book. Final music achievement scores for both tone quality and intonation were determined by summing the three judges' ratings of each student's performance. Fleiss' Kappa, which yields a statistic ranging from 1 (indicating complete agreement) to near zero or even a negative value, was used to measure inter-rater reliability. It was chosen over the Intra-class correlation coefficient because agreement between judges in this study was expected to be good.

The response variable pitch discrimination was measured by the score obtained on the 16-question *SMAPT*, administered both before and after treatment. The posttest score was the actual response variable used to measure pitch discrimination.

All three response variables (tone quality and intonation, as measured by sum of three judges' scores; and pitch discrimination, as measured by the number correct on the *SMAPT* posttest) were subjected to an ANOVA (2-sample *t*-test, in this case) to establish whether there was a significant difference in the mean scores obtained by the students in the control and treatment groups. Since the groups were semi-randomly created on the basis of the *SMAPT*, the ANOVA was deemed likely to be appropriate for this study. However, in case the group assignment was not sufficiently random, an Analysis of Covariance (ANCOVA) was also performed on each variable.

CHAPTER 4

FINDINGS

The purpose of this study was to determine whether beginning brass students who sang tonal patterns, using the movable *do* solfege system, prior to performing those patterns on instruments would develop a more discriminatory sense of pitch, improved tone quality, and better intonation than those who did not. The research questions that guided the study, with the accompanying findings, appear below.

The final *N* for the study was 36, consisting of 26 males and 10 females, with 19 in the control group and 17 in the treatment group.

Pitch Discrimination

The first research question was as follows: Does singing tonal patterns, using the movable *do* solfege syterm, prior to performing those patterns on instruments, improve students' discriminatory sense of pitch?

The response variable of pitch discrimination was measured by the score attained on the *Selmer Musical Aptitude Pitch Test* (*SMAPT*). Although both groups improved in the area of pitch discrimination, there was no statistical significance between groups.

The analysis shown in Table 1 is based on an ANCOVA, with posttest as the response variable and pretest as the covariate. The initial analysis did not find any significant effect of treatment or gender. The posttest score was fairly highly correlated with the pretest score. Although females performed better than males (by about 1.85

average points) and that the treatment group performed better than the control group (by about 2.24 average points), neither factor was statistically significant.

TABLE 1

ANCOVA

Predicting Posttest Scores Based on Gender, Treatment, and Pretest

Parameter	Coefficient	S.E.	t	P
Intercept	40.31	7.01	5.75	<.0001
Female	1.85	4.83	0.38	0.7
Treatment	2.24	4.25	0.53	0.6
Pretest	0.55	0.08	6.36	<.0001

Note: $R^2 = 0.5407, RMSE = 12.87\ points$

An ANOVA was then performed to examine the differences between pretest and posttest scores, using the gender and treatment group of each student as potential predictors. According to the ANOVA (see Table 2), the typical male student in the control group improved about 7.15 points from pretest to posttest, but there was little effect due to treatment (about 1 point improvement for IT=1, $P = 0.86$) or gender (females scored higher than males by about 4 points on average ($P = 0.5132$). The effect of gender appears large but is not statistically significant, in part due to the fact that the number of females in the sample was small (10 of 39). For this reason the mean 4.17 point expected improvement for females has a large standard error (6.3 points), making the result insignificant (P=.5132).

TABLE 2

ANOVA

Predicting Score Differences Based on Gender and Treatment

Parameter	Coefficient	S.E.	t	*P*
Intercept	7.15	3.78	1.89	0.07
Female	4.17	6.31	0.51	0.5132
Treatment	0.97	5.56	0.17	0.86

Note: $R^2 = 0.0145, RMSE = 16.88$ points

Table 3 shows the average difference between the groups. Again, it must be stated that gender may actually have some effect on scores, but the small number of female participants inhibits the power of this study to detect differences between genders. Similarly, larger sample sizes might provide additional insight on the effects of treatment group (which seem quite small).

TABLE 3	Average Differences		
	Control	Treatment	
Male	7.15	8.12	
Female	11.32	12.29	
			Average Diff = 9.72

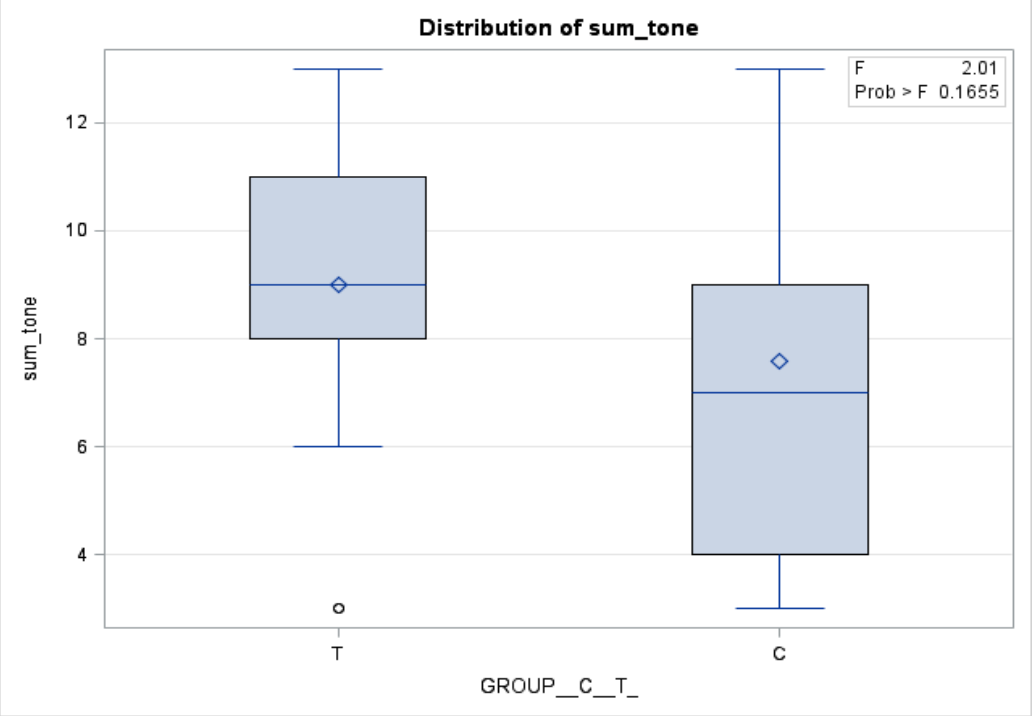
Tone Quality

The second research question was as follows: Does singing tonal patterns, using the movable *do* solfege system, with pure and resonant vowel shapes, prior to performing those patterns on instruments, improve the purity and resonance of tone quality of beginning brass players?

The findings indicated that gender was a statistically significant variable. While the treatment group outperformed the control group, the results were not statistically significant.

The box plot of the sum of tone scores according to group is shown in Fig. 1. The horizontal lines inside the box indicate the median sum of tone scores in the treatment group and control group.

Figure 1: Distribution of the sum of tone scores



The model used here was an ANOVA, which attempts to use treatment group and gender to explain the differences observed in tone quality scores. Table 4 summarizes the model coefficients. The model shows that gender was significant, while treatment was not. The mean sum of tone scores was 6.90 for males in control group, 7.86 for males in treatment group, 10.12 for females in control group, and 11.06 for females in the treatment group. The mean score for females was 3.22 points higher than for males. Students in the treatment group had a slightly higher mean tone quality score, but this increase is not statistically significant.

TABLE 4

ANOVA

Predicting Sum Tone Based on Treatment and Gender

Parameter	Coefficient	S.E.	t	*P*
Intercept	6.90	0.65	10.69	<.0001
Female	3.22	1.00	3.21	0.003
Treatment	0.96	0.90	1.07	0.293

Note: $R^2 = 0.2809, RMSE = 2.66$

Intonation

The third research question was as follows: Does singing tonal patterns, using the movable *do* solfege system, prior to performing those patterns on instruments improve the intonation of beginning brass players?

For intonation, the interaction of gender and group proved to be significant. The box plot for the sum of intonation scores is shown in Fig. 2. The ANOVA model was used for the sum of intonation scores (see Table 5). Results indicated that gender was a significant variable, and the interaction between gender and treatment was also significant. The mean sum of intonation scores was 5.40 for males in the control group, 7.45 for males in the treatment group, 11.25 for females in the control group, and 8.83 for females in the treatment group.

Figure 2: Distribution of sum of intonation scores

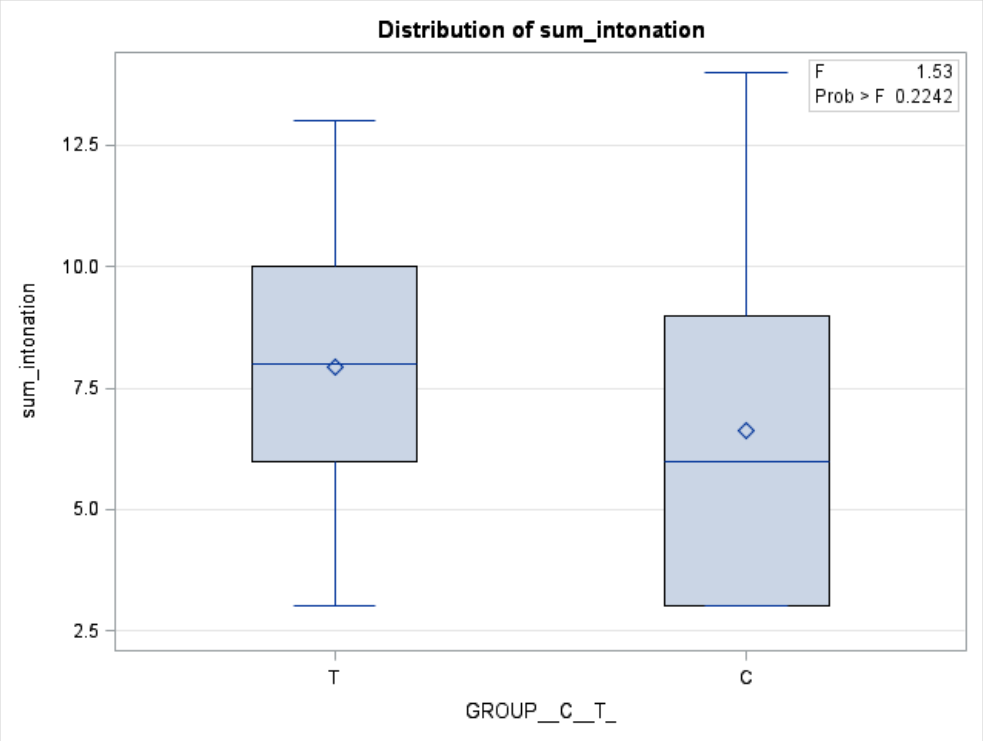


TABLE 5

ANOVA

Predicting Sum Intonation Based on Treatment and Gender

Parameter	Coefficient	S.E.	t	P
Intercept	5.4	0.69	7.87	<.0001
Female	5.85	1.5	3.91	0.0004
Treatment	2.05	1.05	1.95	0.0602
Female: Treatment	-4.47	2.01	-2.22	0.0336

Note: $R^2 = 0.3667, RMSE = 2.66$

CHAPTER 5

SUMMARY, DISCUSSION, AND CONCLUSIONS

Summary

The purpose of this study was to determine whether beginning brass students who sang tonal patterns, using the movable *do* solfege system, prior to performing those patterns on instruments would develop a more discriminatory sense of pitch, improved tone quality, and better intonation than those who did not. The research questions that guided the study appear below, with the accompanying discussion.

The study used a control/treatment group experimental design. Subjects were volunteers enrolled in a sixth-grade band class at one middle school. Participants consisted of 36 brass students: 26 males and 10 females, with 19 in the control group and 17 in the treatment group.

Discussion

Based on the findings of this study, no statistically significant positive conclusions may be drawn. However, some results, although not significant, suggest that the research questions merit further consideration.

Research Question 1: Does singing tonal patterns, using the movable do solfege syterm, prior to performing those patterns on instruments, improve students' discriminatory sense of pitch? The results of this study show that singing solfege tonal patterns prior to performing those patterns on instruments does improve discriminatory sense of pitch, as measured by scores on the *Selmer Musical Aptitude Pitch Test*

(*SMAPT*). This may be assumed because the treatment group's posttest mean score was higher than that of the control group. Examination of individual scores suggests that the factor most closely related to posttest scores was pretest scores. From pretest to posttest, scores of the majority of students either showed improvement or remained the same, and individual students' rankings generally remained static from pretest to posttest. For individual raw data scores, see Appendix F.

Gender also appears to have been an influential factor in the scores of both groups. In both treatment and control groups, females consistently showed higher scores than males. The posttest mean score of the females in the treatment group was 44.40, while the males attained a mean score of 42.55. Females in the control group had a mean posttest score of 42.16, while the mean score for males was 40.31. Two other factors may have affected the male-female score differential: 1) females tend to mature earlier than males; 2) in vocal modeling, the researcher's gender may have given a same-gender advantage to the females.

Research Question 2: Does singing tonal patterns, using the movable do solfege system, with pure and resonant vowel shapes, prior to performing those patterns on instruments, improve the purity and resonance of tone quality of beginning brass players? An examination of the posttest scores from the control and treatment groups shows that the difference between groups was not statistically significant. While females in the treatment group had the highest average sum of tone scores (11.06), treatment was not significant given the sample size. The next highest tone scores belonged to females in the control group (10.12), followed by males in treatment group (7.86), and finally the

males in the control group (6.90). The small sample size of the present study may have been a factor in the failure to find significant differences between treatment groups.

Gender, however, did reach statistical significance. As with the first research question, two factors may have affected the male-female score differential: 1) females' earlier maturation; 2) the researcher's female gender, which may have conferred an advantage in vocal modeling.

Research Question 3: Does singing tonal patterns, using the movable do solfege system, prior to performing those patterns on instruments improve the intonation of beginning brass players? An examination of the posttest scores from each group shows the difference between control and treatment groups was not statistically significant. Gender, however, was significant, and the interaction between gender and treatment was also significant. For intonation, females in the control group had the highest average sum of intonation scores (11.25), followed by females in the treatment group (8.83). Males in the treatment group had an average sum of intonation scores of 7.45, with the males in the control group scoring 5.40, which is 2.05 lower than male subjects in the treatment group.

Results of the current study are similar to those of a study by Mattingly (2012), who examined the effect of listening to and singing a tuning pitch on the intonation of flute players. Using a comparable sample size (N=33), Mattingly also failed to find significant results. Dell (2003), however, provided strong support for a correlation between singing and aural skills and improved intonation in instrumental performance. Dell obtained these results with a much larger sample, 158 beginning students from seven schools.

Observations

Although there is "considerable consensus among authorities as to the importance of vocal activities in the musical development of instrumentalists, singing is rarely used as a pedagogical tool in instrumental classes" (Dunlap, 1989, p. 12). Prominent among the reasons cited by instrumental teachers is lack of time (Dunlap, 1989, p. 12). As a case in point, in preparing for the current study the researcher found that was no easy task to find subjects. Among the many schools that were approached, the discussions often turned on whether the treatment could take place without disrupting the students' progress in the regular curriculum. The results of the present study, while not statistically significant, do provide support for the contention that singing instruction certainly does not hinder students' development of important instrumental skills. Daily singing experiences over the course of an entire year may produce significant results.

Another factor that may have affected the results of the present study is that attendance over the course of the treatment period was problematic. The treatment site was a Title I school, with the challenges that often face high-poverty schools, such as enrollment stability, attendance, and behavior. Three of the original 39 participants moved during the study and were not included in the results. One student missed two weeks of school due to a death in the family, and several were often tardy because of disciplinary referrals.

Little research has been dedicated to children's attitudes toward vocal music instruction, however the studies that have been conducted support the findings and observation of the current study. Colwell cites a study by Austin in 1990, which administered questionnaires to 252 subjects in the fifth and sixth grades regarding the

relationship of music self-esteem to participation in musical activities. Music self-esteem for females was found to be significantly greater than for males ($p < 0.01$). Austin recommends teachers encourage music participation in particular with younger students, and especially focus on younger males.

Colwell cites an even larger study ($N = 2,180$) in 2003/2004 by Scott Phillips, which investigated the attitudes of students in grades six through eight in relationship to their self-concept in music. Findings showed a slight decrease in positive attitude with each grade level with a significant decrease ($p < 0.05$) in low socioeconomic students. Females' positive attitudes were found to be significantly higher ($p < 0.05$) than males for all grades and socioeconomic levels.

Recommendations for Future Research

As shown by the current study, as well as research by Dunlap, time spent singing in the instrumental classroom does not detract from improvement on instrumental achievement. A longer treatment period may show that singing does have a statistically significant effect on musical achievement in the areas of sense of pitch, tone quality, intonation. Yarbrough made similar recommendations, stating that more longitudinal research in this area is needed to gain a greater understanding of the development and radiation of students' capabilities in perception and performance (1995).

It is also recommended that the sample size be increased to include several different schools from a wide variety of areas. Training teachers to conduct the singing activities used in the treatment would allow much larger and diverse sample size. Having teachers conduct the treatment would also control for the effects of gender-related vocal modeling issues.

It is significant that the teachers who generously agreed to host the study already devoted considerable class time to singing. The findings might have been clearer with participants who had very little prior experience with vocal activities in instrumental class.

Given the lack of research on brass-specific musical achievement, this study may provide insight into teaching methods that can benefit elementary students on these instruments. Further research regarding singing in the instrumental classroom with brass players may allow teachers to improve their students ability to produce pure and centered sounds on their instruments, therefore improving the overall musical performance achievement of students.

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APPENDIX A

THE SELMER MUSIC GUIDANCE SURVEY

"This is the Selmer Music Guidance Survey. The survey is divided into four parts, including examples of pitch, melody, harmony, and rhythm. The first section is on pitch. On the recording, you will hear several pairs of musical tones. You are to judge whether the second pitch is the same as the first, or whether it is higher or lower. Let's hear some examples, just for practice. You are not to mark your card on these examples. Here is the first.

Audio: E5- G5: H m3

The second sounded higher, so you would circle the letter H, meaning higher. Here is another example.

Audio: G4- G4: Same

Those sounded exactly alike, didn't they? So you would draw a circle around the S, meaning same. Here is one more example.

Audio: C#5- A4: L M3

The second sounded lower, so you would circle the letter L, meaning lower.

Now have your pencils ready, and listen very carefully. You will hear another pair of tones, and under A1 on your student blank, you will circle H, S, or L depending on whether the second tone is higher, the same as, or lower than the first. Here is A1

A1- *Audio: C5- C5: Same*

A2- *Audio: F4- F4: Same*

A3- *Audio: F5- D5: L m3*

A4- *Audio: E4- G4: H m3*

A5- *Audio: G3- A4: H M2*

A6- *Audio: D5- C5: L M2*

A7- *Audio: G5- F5: L M2*

A8- *Audio: C6- C6: Same*

A9- *Audio: C4- Db4: H m2*

A10- *Audio: D5- Eb5: H m2*

A11- *Audio: G5- G5: Same*

A12- *Audio: A5- Ab5: L m2*

A13- *Audio: G3- Ab3: H m2*

A14- *Audio: G5- Gb5: L m2*

A15- *Audio: A5- A#5: H m2*

A16- *Audio: E6- F6: H m2*

APPENDIX B

STUDENT ANSWER SHEET

SELMER MUSIC GUIDANCE SURVEY
STUDENT BLANK

Student Name _____ Homeroom _____

A-1 H S L	A-2 H S L	A-3 H S L	A-4 H S L	A-5 H S L	A-6 H S L	A-7 H S L	A-8 H S L
A-9 H S L	A-10 H S L	A-11 H S L	A-12 H S L	A-13 H S L	A-14 H S L	A-15 H S L	A-16 H S L
B-1 S D	B-2 S D	B-3 S D	B-4 S D	B-5 S D	B-6 S D	B-7 S D	B-8 S D
B-9 S D	B-10 S D	B-11 S D	B-12 S D	B-13 S D	B-14 S D	B-15 S D	B-16 S D
	C-1 S D	C-2 S D	C-3 S D	C-4 S D	C-5 S D	C-6 S D	
	C-7 S D	C-8 S D	C-9 S D	C-10 S D	C-11 S D	C-12 S D	
D-1 S D	D-2 S D	D-3 S D	D-4 S D	D-5 S D	D-6 S D	D-7 S D	D-8 S D
D-9 S D	D-10 S D	D-11 S D	D-12 S D	D-13 S D	D-14 S D	D-15 S D	D-16 S D

APPENDIX C

PARENTAL PERMISSION CONSENT FORM

Consent Form- Parental Permission

"The Effect of Singing Instruction on Beginning Brass Players' Tone Quality and Intonation"

Researcher's Statement

I am asking your child to take part in a research study. Before you decide to allow your child to participate in this study, it is important that you understand why the research is being done and what it will involve. Please take the time to read the following information carefully. Please ask the researcher if there is anything that is not clear or if you need more information. When all your questions have been answered, you can decide if you want to allow your child to be in the study or not. This process is called "informed consent." A copy of this form will be given to you.

Principal Investigator: *Cara Morantz*
UAB Department of Music
morantz@uab.edu

Purpose of the Study

The purpose of the study is to determine how beginning brass students best learn to play their first pitches on their instruments. Your child is being asked to participate because he or she is a beginner on a brass instrument, which includes trumpet, trombone, euphonium, and tuba.

Study Procedures

If you agree to allow your child to participate, he or she will be asked to ...

- *Engage in singing tonal patterns and playing on instruments without the use of music notation. Regular instruction includes students playing instruments and reading from the method book. The research activity is different because students will learn to sing and play without the use of traditional method book reading and this will be entirely led by the researcher.*
- *Students will be randomly assigned to control and treatment groups.*
- *Your child who is selected to be in the treatment group will receive this playing time three times per week for the first 10 minutes of class on Monday, Wednesday, and Fridays for six weeks. Any participant designated to the control group or non participant will engage in regular band class activities led by the band directors.*
- *Students will be recorded playing a line from method book at the end of the six-week period for research purposes only.*
- *Students will take a musical aptitude test at the beginning and end of the six weeks.*
- *Audio Digital Recorder will be used to record students playing at the end of the six weeks.*

Risks and discomforts

I do not anticipate any risks from participating in this research. Students will be given random codes to identify them throughout the study so that test scores and audio recordings will not to linked to the students. Musical aptitude test scores will be used to randomly assign the treatment and control groups.

Benefits

- *There are no direct benefits to your child for participation. However, probable benefits for participation include improved performance on instruments, more clear tone quality and intonation, an easier time reading music notation, and confidence in music performance.*
- *This study will help to determine whether singing first notes prior to playing them improves musical performance on instruments. If determined during the course of study that the intervention is beneficial to*

the treatment participants, band directors may choose to use the singing activities with all students at their discretion.

Audio Recording

Audio recording is needed to record students playing at the end of the six-week period. The researcher will record each of the individual students and the control and treatment groups. Judges will score the recordings for tone quality and intonation. These recordings will be identifiable with the codes assigned to the students at the beginning of the study. Recordings will be destroyed once study is complete.

Privacy/Confidentiality

The data I collect from students will include information that identifies them indirectly (use of codes). Only the researcher will have access to identifiable information and it will be stored in a secure office. The project's research records may be reviewed by the statistical analysis unit and by departments at the University of Georgia responsible for regulatory and research oversight. Researchers will not release identifiable results of the study to anyone other than individuals working on the project without your written consent unless required by law.

Taking part is voluntary

Your child's involvement in the study is voluntary, and you or your child may choose not to participate or to stop at any time without penalty or loss of benefits to which you are otherwise entitled. Your child's participation in this study will not affect their grades or class standing. If you decide to withdraw from the study, the information that can be identified as yours will be kept as part of the study and may continue to be analyzed, unless you make a written request to remove, return, or destroy the information.

If you have questions

The main researcher conducting this study is *Cara Morantz, a professor at the University of Alabama at Birmingham and a graduate student* at the University of Georgia. Please ask any questions you have now. If you have questions later, you may contact *Cara Morantz* at *morantz@uab.edu*. If you have any questions or concerns regarding your rights as a research participant in this study, you may contact the Institutional Review Board (IRB) Chairperson at 706.542.3199 or irb@uga.edu.

Research Subject's Consent to Participate in Research:

To voluntarily allow your child to take part in this study, you must sign on the line below. Your signature below indicates that you have read or had read to you this entire Parental Permission Form, and have had all of your questions answered.

Your Child's Name: _____

Your Signature: _____ Date _____

Your Printed Name: _____

Signature of Researcher: _____ Date _____

Printed Name of Researcher: _____

Please sign both copies, keep one and return one to the researcher.

APPENDIX D

MINOR ASSENT FORM

Assent Script/Form for Participation in Research
The Effect of Singing Instruction on Beginning Brass Players' Tone Quality and Intonation

I am doing a research study to find out how children like you learn to perform the first pitches on a brass instrument. We are asking you to be in the study because you are in a class for beginning brass students, which includes trumpet, trombone, euphonium, and tuba. If you agree to be in the study, you will be designated in a control or a treatment group. The treatment group will engage in group singing and playing activities on your instrument with me, the researcher three times per week for only 10 minutes for six weeks. The control group students will engage in regular activities with your band director during all instructional time, as will students who do not participate. All students who participate in the study and are designated to a control or treatment group will be recorded performing a line from your method book at the end of six weeks. The recordings will be used for three experts to listen to and rate for tone quality and intonation and will not be directly identifiable to the student. I hope to learn something about how beginning brass players learn to play their first pitches.

You do not have to say "yes" if you don't want to. No one, including your parents, will be mad at you if you say "no" now or if you change your mind later. We have also asked your parent's permission to do this. Even if your parent says "yes," you can still say "no." Remember, you can ask us to stop at any time. Your grades in school will not be affected whether you say "yes" or "no."

I will not use your name on any papers that I write about this project. I will only use a number so other people cannot tell who you are.

You can ask any questions that you have about this study. If you have a question later that you didn't think of now, you can ask me next time.

Cara Morantz, MM
morantz@uab.edu
205-934-8783

Name of Child: _____ **Parental Permission on File:** ☐ Yes ☐ No**
***(If "No," do not proceed with assent or research procedures.)*

(For Written Assent) **Signing here means that you have read this paper or had it read to you and that you are willing to be in this study. If you don't want to be in the study, don't sign.**

Signature of Child: _____ **Date:** _____

(For Verbal Assent) **Indicate Child's Voluntary Response to Participation:** ☐ Yes ☐ No

APPENDIX E

RECRUITMENT SCRIPT

This script will be read to the class of beginning brass students at Bottenfield Middle School

"Hello Class,

My name is Cara Morantz and I am the assistant band director at the University of Alabama at Birmingham. Prior to my appointment at UAB, I taught middle school band for seven years and my favorite part was starting students on their instruments from scratch. I started pursuing my doctorate at the University of Georgia several years ago and now have the opportunity to conduct my own research study. When I think about what I am most interested in, it is still the very best way to teach beginning brass players just like you.

Therefore, I would like to do an experiment to test how singing the first notes effects how well you can play your first notes on your instruments. This technique involves doing a lot of playing back and forth. It also involves playing by ear rather than using the method book to know what to play. Your participation would entail you getting pulled out to work with me for 10 minutes three times per week with a group. It will not

interfere with anything you will do with your regular band directors. Being in the study may improve your ability to perform on your instrument. You could produce a more clear sound with more ease and also learn to read music more easily.

You can choose to participate or not. No one, including your parents, will be mad at you if you say "no" now or if you change your mind later. I have also asked your parent's permission to do this. Even if your parent says "yes," you can still say "no." Your grades in school will not be affected whether you say "yes" or "no."

I will not use your name on any papers that I write about this project. I will only use a number so other people cannot tell who you are.

You can ask any questions that you have about this study. If you have a question later that you didn't think of now, you can ask me next time."

APPENDIX F

RAW DATA TABLE

Student Code	Group	Gender	Instrument	Pretest	Posttest	T1	I1	T2	I2	T3	I3
A1	T	F	Euphonium	31	62	4	3	4	4	4	4
A2	C	M	Euphonium	37	93	3	2	3	2	2	1
A3	C	M	Euphonium	75	100	2	2	3	2	2	2
A4	C	M	Euphonium	25	50	1	1	1	1	2	1
A5	T	F	Euphonium	18	50	3	2	3	3	4	4
A6	T	F	Euphonium	87	93	3	2	3	3	3	2
A7	C	M	Euphonium	62	75	1	1	2	1	1	1
A8	C	M	Euphonium	94	87	2	2	2	2	2	3
A9	T	M	Euphonium	75	100	4	4	3	4	4	4
A10	T	M	Euphonium	100	100	3	2	3	3	4	2
A11	C	M	Euphonium	94	68	2	2	3	2	2	3
B1	C	M	Trombone	50	50	2	2	2	2	3	3
B2	T	M	Trombone	56	81	1	1	1	1	1	1
B3	T	M	Trombone	94	100	2	1	2	2	2	2
B4	C	M	Trombone	68	56	2	1	1	1	1	1
B6	T	M	Trombone	18	31	2	2	3	2	3	2
C1	C	M	Trumpet	81	81	1	1	1	1	1	1
C2	T	M	Trumpet	68	87	4	4	5	5	4	4
C3	T	F	Trumpet	100	100	4	5	5	4	4	3
C4	C	F	Trumpet	75	81	3	4	3	3	3	3
C5	C	M	Trumpet	68	100	5	3	4	4	2	3
C6	T	M	Trumpet	100	100	4	4	3	3	2	2
C7	C	F	Trumpet	62	100	5	5	4	5	4	4
C8	T	M	Trumpet	81	81	2	2	3	2	3	2
C10	C	M	Trumpet	100	100	3	1	2	3	3	2
C12	C	F	Trumpet	87	87	3	3	4	3	4	3
C13	T	F	Trumpet	87	87	2	2	3	2	4	4
C14	C	M	Trumpet	87	93	2	1	2	2	3	2
C15	T	M	Trumpet	100	94	1	1	1	1	1	1
C16	C	M	Trumpet	100	94	2	3	3	3	4	3
C17	T	F	Trumpet	81	81	2	2	3	2	3	2
C18	C	F	Trumpet	75	81	4	4	4	4	5	4
D1	T	M	Tuba	100	100	3	2	3	3	4	3
D3	T	M	Tuba	75	87	4	3	4	4	3	3
D4	C	M	Tuba	94	87	1	1	1	1	1	1
D5	C	M	Tuba	81	68	3	1	3	2	3	1

APPENDIX G

LESSON PLANS

LESSON 1

Teacher Sings and Signs
Students echo

Teacher Play/ Buzz
Students Sing / Sign
Solfege

Teacher Signs
Students Sing

Teacher Buzz
Students Buzz

Teacher Sing/ Sign
Students Play

Teacher Play
Students Play

Slur Warm Up
Do---
Sol---
Do- Sol-
Sol- Do-
Do Sol Do-
Sol Do Sol-

LESSON 2

Slur Warm Up
Do---
Sol---
Do- Sol-
Sol- Do-
Do Sol Do-
Sol Do Sol-

Mi----
Sol- Mi-
Mi- Do-
Sol Mi Sol-
Mi Sol Mi-
Mi Do Mi-
Do Mi Do-
Do Mi Sol-
Sol Mi Do-

LESSON 3

Slur Warm Up
Do---
Sol---
Do- Sol-
Sol- Do-
Do Sol Do-
Sol Do Sol-

Mi----
Sol- Mi-
Mi- Do-
Sol Mi Sol-
Mi Sol Mi-
Mi Do Mi-
Do Mi Do-
Do Mi Sol-
Sol Mi Do-
Do----
Re----
Do- Re-
Re- Do-
Do Do do
Re Re Re-
Do Do Re-
Re Re Do-
Do Re Do-

LESSON 4

Teacher Sings and Signs
Students echo

Teacher Play/ Buzz
Students Sing / Sign
Solfege

Teacher Signs
Students Sing

Teacher Buzz
Students Buzz

Teacher Sing/ Sign
Students Play

Teacher Play
Students Play

Slur Warm Up
Do---
Sol---
Do- Sol-
Sol- Do-
Do Sol Do-
Sol Do Sol-

Mi----
Re----
Do----
Do- Re-
Re- Do-
Do Do do
Re Re Re-
Do Do Re-
Re Re Do-
Do Re Do-
Re- Mi-
Mi- Re-
Do Re Mi-
Mi Re Do-

LESSON 5

Slur Warm Up
Do---
Sol---
Do- Sol-
Sol- Do-
Do Sol Do-
Sol Do Sol-

Do- Mi-
Mi- Sol-
Sol- Mi-
Mi- Do-
Do Mi Sol-
Sol Mi Do-

Do---
Re---
Mi---
Mi Mi Mi-
Re Re Re-
Do Do Do-

Hot Cross Buns

LESSON 6

Slur Warm Up
Do---
Sol---
Do- Sol-
Sol- Do-
Do Sol Do-
Sol Do Sol-

Tonic Triad
Do---
Sol---
Mi----
Sol- Mi-
Mi- Do-
Sol Mi Sol-
Mi Sol Mi-
Mi Do Mi-
Do Mi Do-
Do Mi Sol-
Sol Mi Do-

Do----
Re----
Mi---
Do- Re-
Re- Do-
Do Do do
Re Re Re-
Do Do Re-
Re Re Do-
Do Re Do-
Mi---
Mi Do Mi-
Do Mi Do-

Hot Cross Buns

LESSON 7

Teacher Sings and Signs
Students echo

Teacher Play/ Buzz
Students Sing / Sign
Solfege

Teacher Signs
Students Sing

Teacher Buzz
Students Buzz

Teacher Sing/ Sign
Students Play

Teacher Play
Students Play

Slur Warm Up
Do---
Sol---
Do- Sol-
Sol- Do-
Do Sol Do-
Sol Do Sol-

Tonic Triad

Do----
Re----
Mi---
Do- Re-
Re- Do-
Do Do do
Re Re Re-
Do Do Re-
Re Re Do-
Do Re Do-
Mi---
Mi Do Mi-
Do Mi Do-

Hot Cross Buns

LESSON 8

Slur Warm Up
Do---
Sol---
Do- Sol-
Sol- Do-
Do Sol Do-
Sol Do Sol-

Do----
Re----
Mi---
Do- Re-
Re- Do-
Do Do do
Re Re Re-
Do Do Re-
Re Re Do-
Do Re Do-
Mi---
Mi Do Mi-
Do Mi Do-

Hot Cross Buns

Mary Had a Little Lamb

LESSON 9

Slur Warm Up
Do---
Sol---
Do- Sol-
Sol- Do-
Do Sol Do-
Sol Do Sol-

Tonic Triad
Do---
Sol---
Mi----
Sol- Mi-
Mi- Do-
Sol Mi Sol-
Mi Sol Mi-
Mi Do Mi-
Do Mi Do-
Do Mi Sol-
Sol Mi Do-

Do----
Re----
Mi---
Do- Re-
Re- Do-
Do Do do
Re Re Re-
Do Do Re-
Re Re Do-
Do Re Do-
Mi---
Mi Do Mi-
Do Mi Do-

Hot Cross Buns

Mary Had a Little Lamb

LESSON 10

Teacher Sings and Signs
Students echo

Teacher Play/ Buzz
Students Sing / Sign
Solfege

Teacher Signs
Students Sing

Teacher Buzz
Students Buzz

Teacher Sing/ Sign
Students Play

Teacher Play
Students Play

Slur Warm Up
Add Hi Do

Tonic Triad

Do----
Re----
Mi---
Fa---
Sol---
Do Re Mi-
Mi Re Do-
Do Mi Mi-
Mi- Fa-
Mi Fa Sol-
Sol Sol Sol-
Fa Fa Fa-
Sol Fa Sol-
Sol Sol Fa-
Fa Fa Sol-
Sol Fa Mi Re Do---
Do Re Mi Fa Sol---
Sol Fa Mi Re Do---

LESSON 11

Slur Warm Up
Add Hi Do

Tonic Triad

Do----
Re----
Mi---
Fa---
Sol---
Do Re Mi-
Mi Re Do-
Do Mi Mi-
Mi- Fa-
Mi Fa Sol-
Sol Sol Sol-
Fa Fa Fa-
Sol Fa Sol-
Sol Sol Fa-
Fa Fa Sol-
Sol Fa Mi Re Do---
Do Re Mi Fa Sol---
Sol Fa Mi Re Do---

Mary Had a Little Lamb

LESSON 12

Slur Warm Up
Add High Do

Tonic Triad

Do----
Low Ti---
Do Ti Do-
Ti Ti Do-
Re----
Mi---
Fa---
Sol---
Do Re Mi-
Mi Re Do-
Do Mi Mi-
Mi- Fa-
Mi Fa Sol-
Sol Sol Sol-
Fa Fa Fa-
Sol Fa Sol-
Sol Sol Fa-
Fa Fa Sol-
Sol Fa Mi Re Do---
Do Re Mi Fa Sol---
Sol Fa Mi Re Do---

Mary Had a Little Lamb

Go Tell Aunt Rhodie

LESSON 13

Teacher Sings and Signs
Students echo

Teacher Play/ Buzz
Students Sing / Sign
Solfege

Teacher Signs
Students Sing

Teacher Sing/ Sign
Students Play

Teacher Play
Students Play

Slur Warm Up
Add High Do

Tonic Triad

Do----
Low Ti---
Do Ti Do-
Ti Ti Do-
Re----
Mi---
Fa---
Sol---
Do Re Mi-
Mi Re Do-
Do Mi Mi-
Mi- Fa-
Mi Fa Sol-
Sol Sol Sol-
Fa Fa Fa-
Sol Fa Sol-
Sol Sol Fa-
Fa Fa Sol-
Sol Fa Mi Re Do---
Do Re Mi Fa Sol---
Sol Fa Mi Re Do---
Go Tell Aunt Rhodie

LESSON 14

Slur Warm Up

Tonic Triad

Sol Fa Mi Re Do---
Do Ti Do-
Do Re Mi Fa Sol---
La---
La La La-
Ti---
Ti Ti Ti-
High Do---
Sol La Ti Do
Do Ti La Sol
Scale ascend and descend

Mary Had a Little Lamb

Go Tell Aunt Rhodie

LESSON 15

Slur Warm Up

Tonic Triad

Neighbor Tones
Do Re Do-
Do Ti Do-
Mi Fa Mi-
Mi Re Mi-
Sol La Sol-
Sol Fa Sol-
H Do Ti Do

Passing Tones
Do Re Mi-
Mi Re Do-
Mi Fa Sol-
Sol Fa Mi-
Sol La Ti Do
Do Ti La Sol

Scale
Do Re Mi Fa Sol La Ti Do
Do Ti La Sol Fa Mi Re Do

Teach Star Wars Theme

LESSON 16

Teacher Sings and Signs
Students echo

Teacher Play/ Buzz
Students Sing / Sign
Solfege

Teacher Signs
Students Sing

Teacher Buzz
Students Buzz

Teacher Sing/ Sign
Students Play

Teacher Play
Students Play

Slur Warm Up

Tonic Triad

Neighbor Tones
Do Re Do-
Do Ti Do-
Mi Fa Mi-
Mi Re Mi-
Sol La Sol-
Sol Fa Sol-
H Do Ti Do

Passing Tones
Do Re Mi-
Mi Re Do-
Mi Fa Sol-
Sol Fa Mi-
Sol La Ti Do
Do Ti La Sol

Scale
Do Re Mi Fa Sol La Ti Do
Do Ti La Sol Fa Mi Re Do
Star Wars Theme

LESSON 17

Slur Warm Up

Tonic Triad

Neighbor Tones
Do Re Do-
Do Ti Do-
Mi Fa Mi-
Mi Re Mi-
Sol La Sol-
Sol Fa Sol-
H Do Ti Do

Passing Tones
Do Re Mi-
Mi Re Do-
Mi Fa Sol-
Sol Fa Mi-
Sol La Ti Do
Do Ti La Sol

Scale
Do Re Mi Fa Sol La Ti Do
Do Ti La Sol Fa Mi Re Do

Mary Had a Little Lamb

Go Tell Aunt Rhodie

Star Wars

LESSON 18

Slur Warm Up

Tonic Triad

Neighbor Tones
Do Re Do-
Do Ti Do-
Mi Fa Mi-
Mi Re Mi-
Sol La Sol-
Sol Fa Sol-
H Do Ti Do

Passing Tones
Do Re Mi-
Mi Re Do-
Mi Fa Sol-
Sol Fa Mi-
Sol La Ti Do
Do Ti La Sol

Scale
Do Re Mi Fa Sol La Ti Do
Do Ti La Sol Fa Mi Re Do

Mary Had a Little Lamb

Go Tell Aunt Rhodie

Star Wars