EFFECTS OF CONDUCTOR PREPARATORY GESTURE DIRECTION ON ABDOMINAL EXPANSION OF TEENAGE SINGERS

BY

Emily J. Stefan

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Dr. Melissa L. Grady, Chairperson

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Dr. James F. Daugherty

_____

Dr. Christopher M. Johnson

The thesis committee for Emily J. Stefan

certifies that this is the approved version of the following thesis:

CONDUCTOR PREPARATORY GESTURE DIRECTION ON ABDOMINAL EXPANSION OF TEENAGE SINGERS

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Chairperson, Dr. Melissa Grady

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Abstract

This study examined teenage participants' (*N*=30) lateral abdominal expansion while breathing before singing *America* and viewing a videotaped conductor demonstrating an upward or downward preparatory gesture. PhiMatrix grid overlay software placed over participant videos allowed for measurement of abdominal expansion in millimeters. Results indicated: (a) a difference in abdominal expansion measurement, although not significant, between breaths taken while observing upward and downward conductor preparatory gestures; (b) no significant overall difference on measurement of lateral abdominal expansion when comparing all participants; (c) participants with knowledge of diaphragmatic breathing had consistently larger abdominal measurements than participants with little to no knowledge; (d) male participants consistently displayed larger abdominal measurements when compared to female participants in three out of the four categories; (e) female participants demonstrated a larger abdominal measurement while viewing the downward preparatory gesture than while viewing the upward preparatory gesture; and (f) participants with more choir experience results were not significantly different than participants with less choir experience.

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CHAPTER 1

Introduction

Breath support is the foundation of singing and can be taught in multiple ways. A choral conductor's gesture should encourage proper breath and build on the foundation of proper breath support. A conductor's gesture may impact the effectiveness of the initial breath with nonverbal cues.

The Respiratory System

To understand all that diaphragmatic breathing entails, it is important to understand the anatomy and physiology of the respiratory system. The respiratory system is a series of organs that take in and expel air from the body. It supplies the body with oxygen and expels the carbon dioxide that is generated. The respiratory system also serves for speech and other vocalizations such as laughing and singing (Saladin, 2010).

A variety of muscles are involved in breathing. During inhalation the diaphragm contracts and flattens, simultaneously, external muscles between the ribs draw the rib cage up and outward. Inside this expanded chamber air pressure falls and the lungs expand. When exhaling, the diaphragm and rib cage return to their original positions and the lungs deflate as air flows outward. To produce sound, air passes through the pharynx into the larynx causing the vocal folds to vibrate.

The respiratory center in the brain stem is responsible for communicating to the respiratory muscles when to contract and relax. The medulla directs the spinal cord to maintain breathing and the pons provides further leveling of the respiratory pattern. The control of contracting and relaxing is automatic and continuous, creating continuous unconscious breath (Novotny, 2007).

Phonation

The vocal folds are located in the larynx and have multiple functions. The vocal folds open for inspiration, close for airway protection during swallow, have rapid opening and closing to build up pressure for airway clearance during cough, and use rapid opening and closing to control the frequency of vibration and vocal intensity in coordination with expiratory airflow (Fregosi & Ludlow, 2014).

Phonation requires close coordination between two mechanical processes. The first process is determining pitch, loudness, and quality of sound that is brought about by movements of the vocal folds and the walls of the pharynx, mouth and tongue. The second process is determining airflow and subglottic pressure brought about by movements of the chest wall (Bouhuys, 1966). Humans are able to control vocal fold vibrations to produce different sounds. (McMillan, 2006).

Subglottic Pressure

Subglottic pressure is created by the flow of expired air against adducted vocal folds. Subglottic pressure has been recognized to be important in achieving a constant intensity of sound and has a strong connection to vocal control (Dayme, 2009). Goffi-Fynn and Carroll (2013) state that, "balancing airflow with subglottal air pressure as well as the antagonistic balancing of inspiratory and expiratory muscles can lay the foundation in creating a balanced tone production" (p. 394). Dynamic balance is also altered by subglottic pressure and is controlled by the action of intrinsic laryngeal muscles (Dayme, 2009).

To generate a constant subglottic pressure for singing, a graded coordinated action of the inspiratory and expiratory muscles is required. Sears (1977) considers the intercostal muscles

ideally suited for this task. The intercostal muscles have mechanoreceptors, which are capable of causing delicate adjustments in air pressure.

Diaphragmatic Breathing

"Diaphragmatic breathing" is defined as a technique in which initial attention is on the expansion of the abdomen (Novotny, 2007). It is a breathing technique used widely in sports, music, and various other physical activities. Goldfried, Davison, and Wachtel (1976) give examples of how to practice diaphragmatic breathing. They suggest the singer/athlete lie on his/her back on a flat surface with knees elevated using one hand on the upper chest and the other below the rib cage. As the singer/athlete breathes in through the nose, the stomach should move against the hand while the hand on the chest remains still. This technique can also be practiced while sitting in a chair.

Diaphragmatic breathing is essential in the practice of Yoga. Participants are taught to practice diaphragmatic breathing throughout their practice. The focus of diaphragmatic breathing in yoga is to encourage deep relaxation, to return focus on breathing, and to help reduce stress (Novotny, 2007).

Although the terminology 'diaphragmatic breathing' may not commonly be taught to students in the music setting, it is a technique that is encouraged and is believed to be essential to producing a quality singer. Deidre (2010) discusses that 'sing from your diaphragm!' is one of the biggest vocal myths she hears commonly in her private studio. Students are correct that the diaphragm is used in breathing, but are confused about the actual mechanics of breathing. Deidre's opinion is that breathing is not about feeling the air, working to get the air in, feeling the air controlling the movement of the diaphragm, or lungs filling upward. Rather, breathing is

about knowing inhalation is an active process that is controlled by a mechanism that doesn't require cognition, but can be controlled.

Alt (1990), discusses that students often have a great misunderstanding of breath management, more than any other aspect of singing. He writes, "this lack of understanding often results in sounds that are either too breathy or ones that are strident and edgy" (p. 33). A well energized vocal tone must be built step by step to coordinate opposing muscle groups to be in command of simple muscular activities. His suggestions for improvement include reminding students of spine-conscious posture allowing free movement of the abdominal muscles.

Alternative Breathing Techniques

Miller (1997) teaches a technique that involves the spreading of upper back muscles for better breath support to his singers. This technique is advocated by the British school of voice training and explains the involvement of the back muscles in the respiratory cycle. Miller recommends having the singer lean forward over the music score while attempting to spread his/her back. In this technique, the assumption is made that the thorax will be enlarged and by expanding the muscles of the shoulders and lung capacity will be increased. However, physiological information makes clear the shoulder muscles are not members of the respiratory mechanism and are postural muscles related to movement.

Conducting Gestures

"What *they* see is what *you* get*"* is a concept by choral conductor Rodney Eichenberger (Eichenberger, 1994). It is similar to the familiar phrase, "monkey see, monkey do," and demonstrates the impact of conducting gestures, verbal communication, and facial communication on choral sound. Human nonverbal communication and its relationship of daily human movement to pitch, language, and sound, have led Eichenberger to formulate a unique

philosophy based on the universal perception of specific movements and their effect on sound (Con, 2002). Eichenberger's strong belief that there is a direct relationship between gestures and sound has encouraged many research studies to further develop the reliability of this concept. Eichenberger believes, "there is no right or wrong way to conduct" (Con, 2002, p. 66) and the purpose of a conducting gesture depends on the conductor's intent for the musical sound they are trying to achieve (Eichenberger, 1994).

Perceptions of the Conductor's Role

The traditional notion of a conductor's role is that of a dictator, with the vision, knowledge, and ability to interpret the musical score. This perception has led to high expectations of the conductor's role from both the conductors themselves as well as those they conduct (Durrant 2009).

When a conductor rehearses an ensemble, both verbal and nonverbal communication is important. However, when the ensemble is performing, communication is largely nonverbal. Proactive nonverbal communication is necessary to achieve an overall successful final product. According to Killburn (2016), conducting is physical, psychological, and potentially spiritual and a conductor's gestures should be infused with technical competence and emotional connection. McKinney believes, "being able to change sounds implies that you know the nature of the sound, that you know how musical instruments function, and that you understand the relation of the vocal instrument to the physical process that governs it" (McKinney, 1994, p. 13).

Nonverbal Communication

Nonverbal communication is an important part of the human thought process. Many of the gestures people use are as much a part of their thoughts as verbalizations. A conductor needs

knowledge and thoughtful application of nonverbal communicative gestures to enhance and clarify the communication of the conductor's musical intent (Ford, 2001).

Nonverbal communication for a conductor includes facial expression, posture, body language, and the conducting gesture. Much of the conductor's job is nonverbal and many studies have shown those nonverbal communications to have an effect on overall musical sound production. "If the conductor uses gestures that reflect a nonverbal ensemble (interference), he or she will have to stop and verbalize the desired concept. Most likely, verbalization will need to occur over the course of several repetitions, until the ensemble learns to ignore the mixed message. However, the conductor can choose to employ conducting gestures that reflect standard nonverbal communication ideas similar to the musical result he or she desires from the group" (Ford, 2001, p. 22).

Bonner (2009) discusses the use of non-verbal communication in solving problems unique to choral conducting and the creation of a dynamic and engaging performance. Bonner poses that the role of the conductor has evolved throughout many years from keeping the beat to turning conducting into an art form. He also mentions a few choral educators have begun to assert the importance of non-verbal communication to choral performance. Bonner states, "the careful refinement of non-verbal signals needs to be a top priority for all choral conductors who desire to facilitate their choirs' performance without wasting time or lulling them to dullness while they stop to verbalize everything that they hope to attain. Traditional conducting approaches provide a starting point for reaching the desired goal, but innovative gestures and new developments in non-verbal communication have the potential to create a more inspired and pleasing musical offering" (Bonner 2009, p. 35).

Preparatory Conducting Gesture

The Merriam-Webster dictionary defines preparatory as, “preparing or serving to prepare for something” (Merriam-Webster, 2016). Many choral conducting texts state that the preparatory gesture must happen in tempo and display the dynamics and mood of the piece (Seighman, 2015).

There are differentiating opinions on the direction of the most effective preparatory gesture. Green believes, an upward movement in the preparatory gesture is the clearest perception of the downbeat (Green, 1981). On the contrary, Eichenberger suggests an upward moving preparatory gesture may lead to shallow breathing (Eichenberger, 1994).

Need for the Present Study

Many pedagogues believe in the benefits of diaphragmatic breathing when singing and the effect of a conductor’s gesture on performers. Research is needed to further investigate the effects preparatory conducting gestures may have on performer’s diaphragmatic breathing.

To date no study documents the effect of the upward and downward preparatory gesture on diaphragmatic breathing. Manternach (2009) investigates the effect of the preparatory gesture on shoulder movement and discusses the possibility of future research to further develop his results. Data from this study could influence conductors to use a preparatory conducting gesture that is most efficient in assisting singers to develop a better diaphragmatic breathing technique.

Purpose Statement

The purpose of this study was to examine the effects of downward and upward preparatory conductor gestures on the lateral abdominal expansion of individual teenage singers.

Research Questions

To that end, the following research questions directed this case study:

1. Does an upward or downward conducting preparatory gesture encourage a larger measurement of lateral abdominal expansion?
2. Does each participant differ in measurement of lateral abdominal expansion for each of the four iterations of *America*?
3. Do participant questionnaire responses show relationships with lateral abdominal expansion?

Definitions

Conducting plane – The vertical location at which the conductor shows the entrance cue and conducting beat.

Diaphragm – A large flat muscle that separates the lungs from the stomach area and that is used in breathing.

Diaphragmatic Breathing – A breathing technique where initial attention is on the expansion of the abdomen; sometimes referred to as abdominal or belly breathing (focus on expansion of the rib cage during inhalation).

Downward Preparatory Gesture – A gesture in which the conductor begins with the right hand at the natural waist level. The conductor then breathes while lowering the hand to the belt region, raising it again to mid chest level, and then lowering it natural waist level for the downbeat of the melody.

Upward Preparatory Gesture- A gesture in which the conductor begins with the right hand at the natural waist. The conductor then breathes while raising the hand to mouth level, before dropping it again the waist level.

CHAPTER 2

Review of Literature

This chapter reviews verifiable research literature related to the technique of diaphragmatic breathing and conductor gesture. This chapter begins by examining studies of forms of musical instruction. Thereafter, this review examines studies relating to specific examples of conductor gesture and diaphragmatic breathing.

Forms of Instruction

Skadsem (1997) studied the effect of conductor verbalization, dynamic markings, conductor gesture, and choir dynamic level on singers' dynamic responses. The investigator divided undergraduate, graduate, and high school students (*N*=144) into three groups: conductors (*n*=48), college singers (*n*=48), and high school singers (*n*=48). Participants sang *Michael, Row the Boat Ashore* ten times while watching a recorded conductor. The first time included two practice excerpts preceding three different conductor gesture combinations: (a) Phrase 1 medium/Phrase 2 medium; (b) Phrase 1 medium/Phrase 2 small; and (c) Phrase 1 medium/Phrase 2 large. Participants sang nine more times following verbal instruction. Three judges evaluated singers performance responses using a continuous response digital interface (CRDI). Results indicated that verbal instruction showed a significantly stronger influence than the other three modes of instruction on the singers' dynamic singing responses. Singers also responded significantly better to instructions regarding soft dynamics than to instructions regarding loud dynamics. Results showed a significant positive correlation between the scores on the gestural excerpts and eye contact.

Kelly (1997) investigated the effects of conducting instruction on beginning band students' performances. The investigator randomly assigned eight ensembles of beginning band

students (*N*=151) to either the control group or the experimental group. The experimental group (*n*=4 ensembles) received conducting instruction for a maximum of ten minutes per class. The control group (*n*=4 ensembles) received no conducting instruction and their assigned instructor conducted their warm up in the same matter as the treatment groups. Following the treatment period, the participants responded to a posttest on their rhythm performing abilities. Seven judges used a rating sheet to evaluate the ensembles' pretest and posttest audiotapes and rated the quality from lowest to highest on a Likert-type scale. Results indicated participants in the experimental group showed greater improvement than the control. The experimental treatment seemed to have a mixed effect on the ensemble performance variables.

Cofer (1998) investigated the effects of short-term conducting gesture instruction on seventh-grade band students' recognition and performance response to conducting gestures. The investigator separated seventh-grade wind instrumentalists (*N*=60) into two groups. The first group (*n*=30) received instruction designed to improve their recognition and response to common conducting gestures. The second group (*n*=30) participated in a warm-up routine designed to review concepts of musical expression without the use of conducting gestures. Results indicated that the participants related to and performed better when they received instruction to improve their recognition and response to conducting gesture.

Galops (2005) studied the effect of conducting gesture on the stylistic response of musicians. Experienced instrumental conductors (*N*=15) listened to an excerpt that did not contain any complex rhythms or technical challenges three times. The investigator recorded each of the experienced conductors (*N*=15) conducting each of the marked excerpts using gestures to represent the expressive-interpretive markings. College level instrumentalists (*N*=25) performed individually with the recorded conducting videos. Using a Likert Scale, experts evaluated

conducting gesture effectiveness and the musician performance responses compared to the expression markings of the excerpt. Results indicated the performers responded favorably to the musical interpretation of conductors who had command of a variety of conducting gestures. Results also indicated the same conductors with command of a variety of conducting gestures elicited specific musical responses from the musicians.

Sidoti (1990) investigated high school band musicians' ability to respond to indicated expression markings while simultaneously following gestures of a conductor. High school instrumentalists (*N*=139) practiced four melodies without expression markings for three days. Participants then performed the excerpts with expressive markings while following a videotaped conductor. The conductor used expressive gestures on two of the melodies and non-expressive time beating on the remaining two. Results indicated a significant difference between the performance accuracy of selected expression markings. Almost all of the musical expression variables rated higher in the expressive conducting condition compared to the unexpressive.

Conductor Expressivity

Morrison and Selvey (2011) investigated conductor expressivity on choral ensemble evaluation. Two conductors conducted the same excerpt with high- and low- expressivity while being video recorded. The researchers synchronized the four videos with the same audio performance recorded by the university's mass choir. The videos were divided into four excerpts: (a) conductor 1, high expressivity conducting (b) conductor 1, low expressivity, (c) conductor 2, high expressivity, (d) conductor 2, low expressivity. Students (*N*=429) at nine secondary schools viewed, listened, and rated the expressivity of each choral performance using two 10-point Likert-type scales. A control group (*n*=155) rated an audio-only version and the experimental group (*n*=274) viewed the four videos with audio. After each video excerpt, participants assessed

the performance expressivity of both the choir and the conductor. Results indicated that conducting expressivity affected the evaluation of an ensemble's performance. Participants rated the high-expressivity conducting excerpts significantly more expressive than in the low-expressivity conducting experts.

Silvey and Koerner (2016) investigated the effects of expressive and unexpressive conducting in a band setting. Participants (*N*=125) began their typical warm-up routine, tuning procedures, and musical selections led by their band director during two experimental sessions held one week apart. At the end of the rehearsal, the conductor led the band in the one minute excerpt twice. The conductor in the first session used expressive conducting followed by unexpressive conducting. In the second session, the order reversed in which the conductor conducted unexpressively followed by expressively. After completion of the excerpt the students responded to a survey about their perceptions of the expressive and unexpressive conducting conditions. Two weeks following the second session, the participants evaluated the audio recordings in expressivity using a 7-point Likert scale. Expert band directors (n=40) evaluated the audio excerpts using the same 7-point Likert scale. Results found no differences in ratings of expressively and unexpressively conducted ensemble performances. Results also showed significant three-way interaction between conductor expressivity, ensemble level, and evaluator group.

Price, Mann, and Morrison (2016) investigated the effects of conductor gestures on the assessment of ensemble performances with non-music majors. Participants (*N*=284) listened to two identical audio recordings, while two conductors displayed different conducting styles. The first conductor utilized expressive conducting and the second strict conducting. Participants rated the excerpts and provided one comment for each the ensemble and one comment for the

conductor. Results indicated the strict conducting resulted in lower assessments for the conductors and the ensembles.

Byo (1990) studied the recognition of intensity contrasts in the gestures of beginning conductors. Byo randomly selected graduate students, undergraduate students, non-music majors, and high school band and choir students (*N*=320) from performing ensembles. Participants viewed a pre-recorded video of a conductor using contrasting intensity. Each pair consisted of one positive and one negative example of gestural behavior. The Participants determined high intensity and low intensity across 15-second intervals and used a 10-point Likert scale to give an overall intensity rating for each completed conducting segment. Results indicated that when the conductor used intensity, the intensity became recognizable across multiple illustrations and diverse levels of musical experience. Byo suggested that further examination of conductor intensity might focus on effect of conducting intensity on performer achievement, attentiveness, and attitude.

Nonverbal Gestures

Grady (2014) studied the effects of nonverbal conductor behaviors on timbre, intonation, and perceptions of university choirs. She also investigated the significant relationships between the conductor behaviors and the timbre and intonation of the choirs. Three university choirs (*N*=61 singers) sang the motet, *O bone Jesu* ten times, each time viewing a different videotaped conductor. Each of the conductors used the same tempo, no baton, and wore all black. During each choir recording session, the investigator audio recorded the three choirs and participants completed a two-question questionnaire. Post-recording, Grady evaluated each conductor's gestural plane and hand shapes. Undergraduate music therapy and music education students (*n*=30) evaluated facial expressions of each conductor.

Singer questionnaire results included significantly different aggregate ratings of the ten conductors with respect to perceived clarity of gestures and singing efficiency. LTAS analyses found differences in spectral energy, significantly strong positive correlations suggesting that those conductors whose nonverbal gestures evoked more spectral energy in the choirs' sound tended also to elicit more in tune singing. Pitch analysis showed that the choirs sang significantly more in tune while following some conductors and significantly less in tune for other conductors. Both timbre and pitch results appeared to be largely conductor specific, and the ten conductor participants exhibited significantly different amounts of aggregate time spent in the gestural planes and hand shapes analyzed.

Daugherty and Brunkan (2013) investigated the mimicry of a conductor's nonverbal behavior of lip rounding in singers. Participants (*N*=114) watched two pre-recorded videotapes of a conductor while singing Mozart's motet *Ave Verum Corpus*. The first conductor video served as a control with a neutral face. The second video, serving as the experimental video, showed the conductor using lip rounding forming the [u] vowel on the words *verum* and *corpus*. Seven expert judges viewed the photos taken of each participant when singing each [u] vowel and indicated less or more lip rounding when comparing the photos. The researchers used a grid software to analyze the photos. Results indicated 90% of the participants mimicked a conductor's rounded lip posture according to the judges and confirmed by the grid analysis.

In an unpublished study, Grady (2013) investigated the effects of multiple conductors (*N*=6) on a women's chorus (*N*=18). The women's chorus performed 20 measures from a previously learned and memorized composition. Each conductor, including the choir's usual conductor who served as a baseline, nonverbally conducted the selected measures. Expert listeners (*N*=8) analyzed the audio recordings. Results indicated significant mean signal

amplitude differences between the baseline condition and each of the guest conductor conditions, the most out of tune singing occurred with conducting gestures that rose above shoulder height, and all expert listeners heard differences in overall choral sound.

Vocal Tension and Conductor Gesture

Fuelberth (2003a, 2003b, 2004) tested the effects of various left-hand conducting gestures in a series of studies. In her first study (2003a), high school choir students (*n*=35), undergraduate and graduate college singers (*n*=34), and undergraduate and graduate college students with conducting experience (*n*=34) sang ten measures of the folk song, *Turtle Dove* with a videotaped conductor. Participants sang while viewing the following six conditions: (a) left hand, no change; (b) left hand, fisted gesture; (c) left hand, palm up; (d) left hand, palm down; (e) left hand, stabbing gesture; and (f) left hand, sideways phrase shaping gesture. Three judges rated vocal tension on 10-point Likert scale for each condition. Results indicated that that the fisted and stabbing gestures generated the highest amount of vocal tension.

Fuelberth's second study (2003b) used the same left-hand gestures and folk song with more participants. Participants (*N*=103) individually sang the melody with a pre-recorded conductor video. Three experienced choral directors judged the videotapes of the participants and analyzed inappropriate singer tension during the first four measures and the six experimental measures using a 10-point Likert-type scale. Results indicated the fisted and stabbing gestures demonstrated the highest amount of singer tension and an increase in inappropriate singer tension during all experimental conditions when compared to baseline ratings.

In a third study, Fuelberth (2004) looked at perceptions of inappropriate vocal tension using the same melody and left-hand gestures. Participants (*N*=192) used a 10-point Likert-type scale to evaluate the amount of inappropriate vocal tension that could hypothetically be

generated by the videotaped conductor's gestures. Results indicated that participants anticipated the stabbing and fisted gestures to produce more vocal tension compared to the no change condition.

Manternach (2012) studied the effects of conductor preparatory arm, head, and hand movements on singer extrinsic laryngeal muscle engagement and voicing behaviors. Experienced choristers (*n*=15) and naïve choristers (*n*=8) sang the first phrase melody of Mozart's *Ave Verum Corpus*. Participants wore sEMG electrodes to collect physiological data while singing. As the participants sang, they viewed a pre-recorded conductor displaying a variety of preparatory gestures: (a) upward gesture direction, neutral head condition, palm open hand condition, (b) upward gesture direction, neutral head condition, fisted hand condition, (c) upward gesture direction, up head condition, palm open hand condition, (d) upward gesture direction, up head condition, fisted hand condition (e) downward gesture direction, neutral head condition, palm open hand condition, (f) down gesture direction, neutral head condition, fisted hand condition, (g) down gesture direction, up head condition, palm open hand condition, (h) down gesture direction, up head condition, fisted hand condition. While singing, the investigator audio recorded participants for analysis.

Results indicated significant increases in suprahyoid mean muscle region activity during upward moving gestures compared to downward moving gestures. Results also indicated significant increases of sternocleidomastoid mean muscle region during fisted compared to palm open conducting gestures. The fisted conductor conditions evoked higher sung amplitudes than the palm open condition, as well as more occurrences of raised median format frequencies than palm open conditions. A listening panel perceived singer inhalation during upward moving gestures to be less efficient than the downward moving gesture. The listening panel also

perceived the upward moving, up head and fisted gesture increased levels of inappropriate singer tension.

Breath Support

Various researchers analyzed breathing in the production of singing. Thomasson and Sundberg (2001) found inhalatory behavior to be important to voice source in singing. Griffin, Woo, Colton, Casper, and Brewer (1995) analyzed the definition of a supported singing voice based on physiological characteristics. Participants (*N=8*) voice samples were audio recorded while they sang multiple pitches. Researchers analyzed the samples with an EGG. Results showed voice quality differences between supported and unsupported singing. The findings also indicated changes in laryngeal and glottal configuration such as lowering the larynx and closing the glottis tightly may play an important role in voice support.

Thorpe, Cala, Chapman, and Davis (2001) discussed the multiple controversies concerning vocal techniques that optimize singing performance. They examined the increase and decrease in abdominal dimensions when using a technique for projection. As a means of support as part of a strategy to increase the intensity of projection, the investigators instructed professional singers (*N*=5) to change the intensity of projection. Participants sang part of an aria twice while being instructed to first perform as if projecting over an orchestra and secondly to perform as with a smaller accompanying orchestra without the need to project. Linear magnetometers measured the anterior-posterior and lateral dimensions of the rib cage and abdomen. Results indicated a significantly wider lateral dimension of the rib cage for the projected condition at both initiation and termination of the voice and significantly narrower initiation of the lateral abdominal dimension.

Graham (2014) analyzed the role of laryngeal function in breathing for singing. Thirty-

six participants received an assessment of their voice and communication characteristics including a voice self-assessment, auditorium-perceptual assessment, visual imaging of the laryngeal structure and a series of acoustic and aerodynamic measurements. Results showed airflow rate increased as glottal closure decreased as well as a negative correlation between mean airflow rate and laryngeal airway resistance.

A large number of subjects demonstrated glottal insufficiency although not reported as breathiness, as shown through videoscroboscopy. Incomplete glottal closure translated to the limited capacity to increase the intensity of the singing and speaking voice, and lower maximum phonation times resulted in glottal insufficiency.

Diaphragmatic Activity

Leanderson, Sundberg, and von Euler (1987) evaluated diaphragmatic activity during various musical tasks. Four highly trained male singers performed: (a) a series of octave intervals, (b) a sequence of subito forte/subito piano scales, and (c) a coloratura scale. The subjects swallowed an esophageal catheter with two small pressure transducers to record the transdiaphragmatic pressure. Results revealed signs of diaphragmatic activity during phonation in singing. Two of the subjects used their diaphragm in a similar way when performing octave intervals and tones with suddenly changing loudness. Leanderson, et al. also observed diaphragmatic activity when the subjects repeatedly produced the syllabus /pa/. Some subjects used the diaphragm to reduce subglottal pressure and hence air expenditure during the /p/ occlusion. Overall, the researchers found several examples of varying diaphragmatic activity in singing.

Preparatory Gesture

Manternach (2009) studied the effect of conductor head and shoulder movement and

preparatory gesture direction on upper body movement in individual singers. Experienced chorister college students (*N*=30) and less experienced chorister college students (*N*=30) sang *America* while watching a videotaped conductor and standing with a grid placed behind their shoulders and another gird in profile to their face. Participants wore a choir robe with a preplaced shoulder clip on the right shoulder. Participants sang five times total, singing one time each under the following conductor conditions: (a) up head, upward preparatory, (b) down head, downward preparatory, (c) upward shoulder shrug, upward preparatory gesture, (d) regular downward preparatory, (e) regular upward preparatory. By means of the grid, front and side videos allowed for measurement of singer head and shoulder movement of participants. Results indicated significantly higher shoulder movement during a downward moving gesture.

CHAPTER 3

Method

Purpose of the Study

The purpose of this study is to examine what effect, if any, conductor preparatory gesture direction (upward, downward) may have on the lateral abdominal expansion of individual teenage singers ($N = 30$) as measured during inhalation before singing a familiar song while viewing a videotaped conductor. This chapter addresses the methods, procedure, and equipment used in this study.

Stimulus Videotape

To control for potential confounding variables, participants watched a videotaped conductor. The conductor wore a black, long-sleeved shirt and black pants and stood in front of a solid white background.

To create the stimulus videotape, the conductor executed the upward and downward preparatory gestures employed in this study while being filmed. The conductor recorded as many times as necessary to arrive at consistency across all trials in (a) beginning hand position on the conducting plane, (b) distance moved either up or down, (c) hand shape, (d) neutral facial affect, and (e) minimal body movement outside of the arm, hand, and head. Three expert conductors evaluated the video on a scale from 1 to 10 for consistency in all the trials. The average overall evaluation result being 7.6 for beginning hand position on the conducting plane, 7.6 for distance moved either up or down, 9.0 for hand shape, 10.0 for neutral facial affect, and 9.0 for minimal body movement outside of the arm, hand, and head.

The conductor video contained a piano accompaniment of the piece. While the piano introduction played the conductor stood still, then the conductor showed either the upward or

downward preparatory gesture and used a basic three pattern for the rest of the song. For both preparatory gesture conditions, the conductor modeled a breath by opening her mouth, but with other facial activity remaining neutral. Preparatory gestures used to cue the participants (a) upward, and (b) downward are shown in figures 1 and 2.

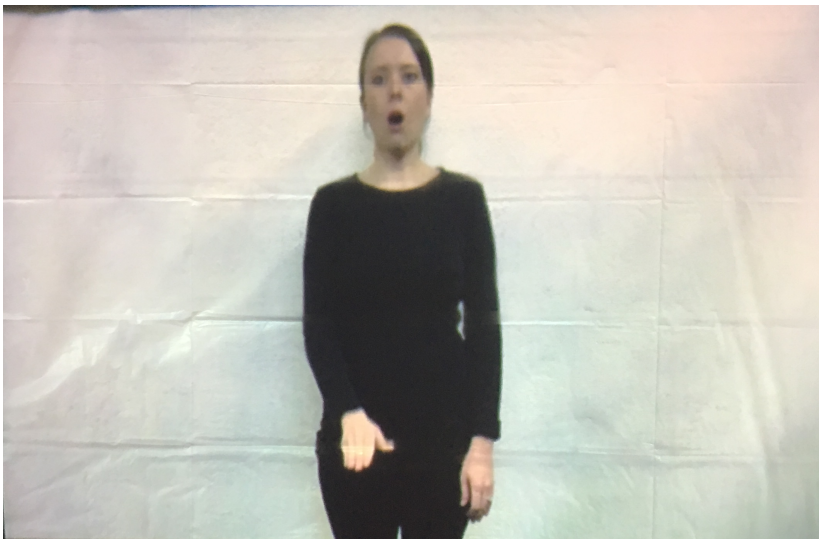

Figure 1. Downward preparatory gesture.

Figure 2. Upward preparatory gesture.

For the upward gesture, the conductor began with her hand at the waist, took a breath while raising her hand to mouth level before dropping it again to the waist level. For the downward gesture, the conductor began with her hand at the waist, lowered her hand to the belt region, raised it to chest level, and lowered it to the waist for the downbeat.

To control for potential order effect, participants viewed each preparatory gesture condition video (upward and downward) twice and the order varied for participants. See Table 1.

Table 1.

Six Variations of the Two Preparatory Gesture Conditions

Order	*1*	*2*	*3*	*4*
1	D	U	D	U
2	D	D	U	U
3	U	D	U	D
4	U	D	D	U
5	D	U	U	D
6	U	U	D	D

Note. U = upward preparatory gesture; D = downward preparatory gesture

Participants

Participants (N = 30) comprised students of varied choral experience from a rural junior-senior high school. The sample comprised 53% female participants (n = 16) and 47% male participants (n = 14). Participants were in grades seven through twelve and were all currently enrolled in choir. Only 7% of participants (n=2) reported participating in at least one year of voice lessons.

Procedures

Prior to entering the research room, participants received the Assent Form (Appendix B) and completed a signed consent form (Appendix C & D). Each participant received a temporary

binder clip placed on the back of their shirt to tighten the slack for a tight fit around the abdominal region for breath measurement analysis (Figure 3).

Figure 3. Binder clip placement.

The researcher placed one bright colored sticker one inch away from the participant's belly button on both the left and right. On each side of the abdominal region parallel to the belly button, the investigator placed another sticker. The investigator placed two more stickers on the participant's forearms to possibly distract the participant from focusing on the abdominal region (Figures 4 & 5).

Figure 4. Sticker placement.

Figure 5. Lateral sticker placement.

Participants received a copy of *America* by Samuel F. Smith to review in the hallway before entering the research room (see Figure 6). Participants practiced the piece until they could sing it from memory. Participants entered a multi-purpose rehearsal room where the investigator instructed the participants to stand on an 'X' marked on the floor. The 'X' placed on the floor measured 87 inches from a projected image of the conductor. The investigator instructed the participant to sing *America* four times following the video-taped conductor. A recorded piano accompaniment played for each of the four trials for each participant. At the completion of the recording session, participants completed a questionnaire.

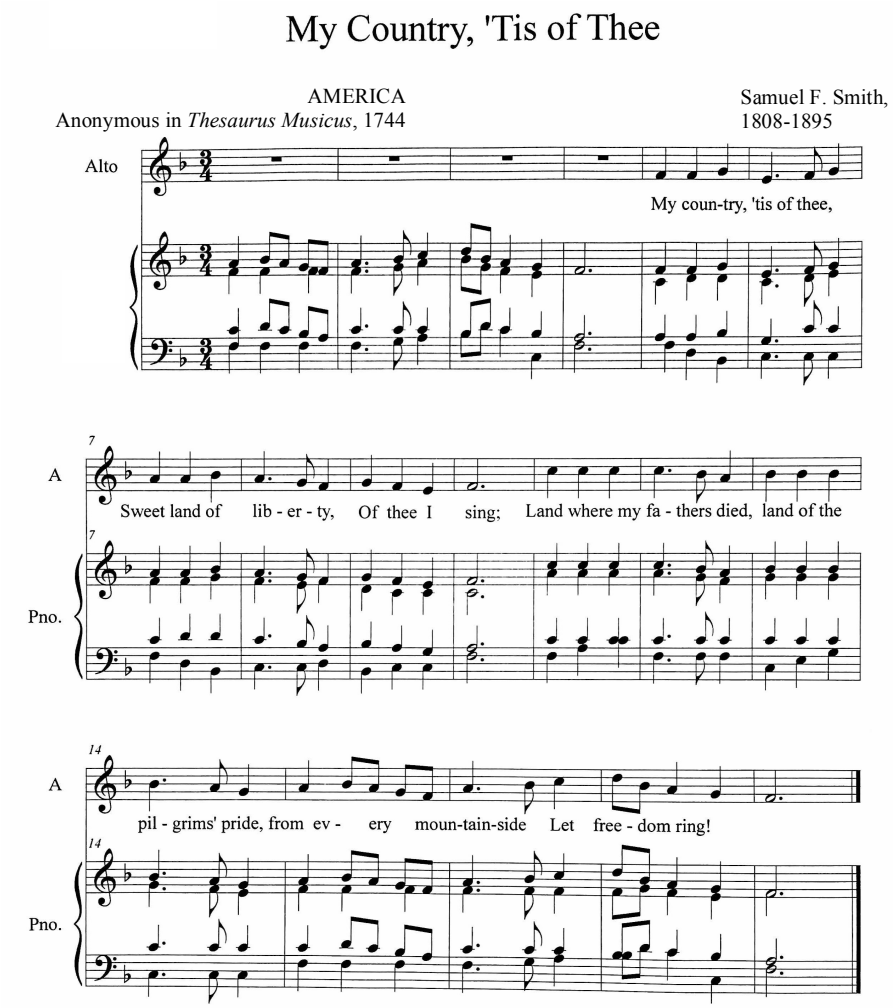

Figure 6. Sung musical excerpt *America* by Smith.

Video Recording Equipment

An Apple IPAD was placed 27 inches to the left and 18 inches to the front of the 'X' on the floor to video the participants. This camera focused on a side view of the abdominal area at a slight front angle so the forearm would not be an obstruction. The camera angle and zoom remained constant throughout the study in order to maintain a consistent grid size. The researcher adjusted camera height for each participant.

Questionnaire

Following the experimental portion of the study, participants completed a questionnaire (Appendix D). They responded to prompts about sex, age, experience singing in choirs,

experience playing in an instrumental ensemble, and experience taking private voice lessons. Participants responded to whether they noticed a difference in the four videos and of their knowledge of diaphragmatic breathing.

Video Analysis

After the recording sessions, the investigator uploaded videos of each participant to QuickTime Software. PhiMatrix Analysis Software (Meisner 2004), a grid overlay system, allowed for placement of a grid on top of each video. The PhiMatrix grid measured 1 mm apart vertically and allowed measurement of grid squares while the participant inhaled. The investigator placed the grid on the participant's abdominal region at the smallest point prior to inhalation on the sticker to the left of the participant's belly button in the first quadrant. A second measurement was recorded at the largest point of inhalation. The researcher measured the lateral abdominal expansion in mm using a PhiMatrix grid (Figures 7 and 8).

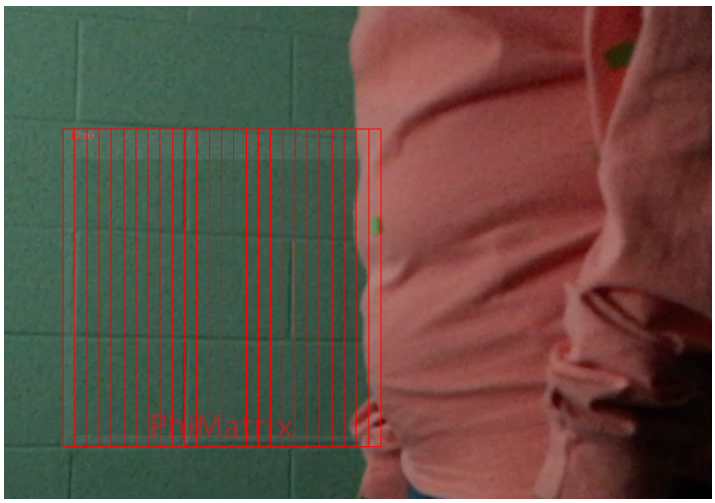

Figure 7. Grid placement prior to inhalation.

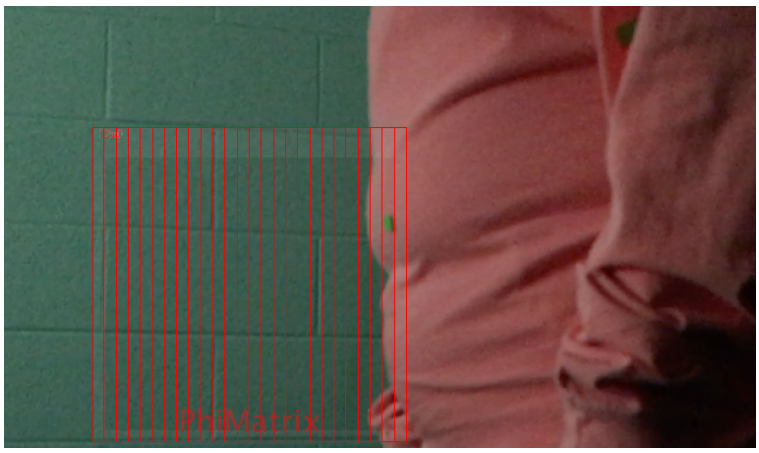

Figure 8. Grid placement at the end of inhalation.

CHAPTER 4

Results

The purpose of this investigation was to examine the effects of downward and upward conductor preparatory gestures on abdominal expansion of individual teenage singers. This chapter presents the results according to the research questions posed for this investigation.

Research Question One: Upward and Downward differences

The first research question inquired if a downward or upward preparatory gesture encouraged a larger measurement of lateral abdominal expansion in individual singers. The researcher used an Independent two-tailed *t*-test to evaluate the data (table 2). Results indicated a difference between upward preparatory and downward preparatory gestures, $t\ (29) = 0.78,\ p < .05$, however, results did not yield significant differences.

Table 2.

Upward and Downward Differences

Direction	Mean	Standard Deviation
Downward	.6583	.58579
Upward	.4667	.59565

Research Question Two: Difference in Breath Measurement

The second research question inquired about differences in the measurement of lateral abdominal expansion for each participant as he/she took a breath before singing 'America.' To evaluate the data the researcher used a Paired Samples *t*-test (table 3). Results indicated no significant difference $p = 0.314$, $p < .05$ in measurement of abdominal expansion while viewing the upward or downward preparatory gestures.

Table 3.

Differences in Participant Abdominal Measurement

Direction	Mean	Standard Deviation
Difference Downward	-.0167	.87576
Difference Upward	-.2333	.83803

To disaggregate the data, the researcher examined breath measurement in terms of singer choral experience, sex, and knowledge of diaphragmatic breathing. Figure 9 displays average abdominal movement measurement according to years of choral experience. More experienced choristers are categorized as participating in choir for four years or more. Less experienced choristers are categorized by any amount less than four years.

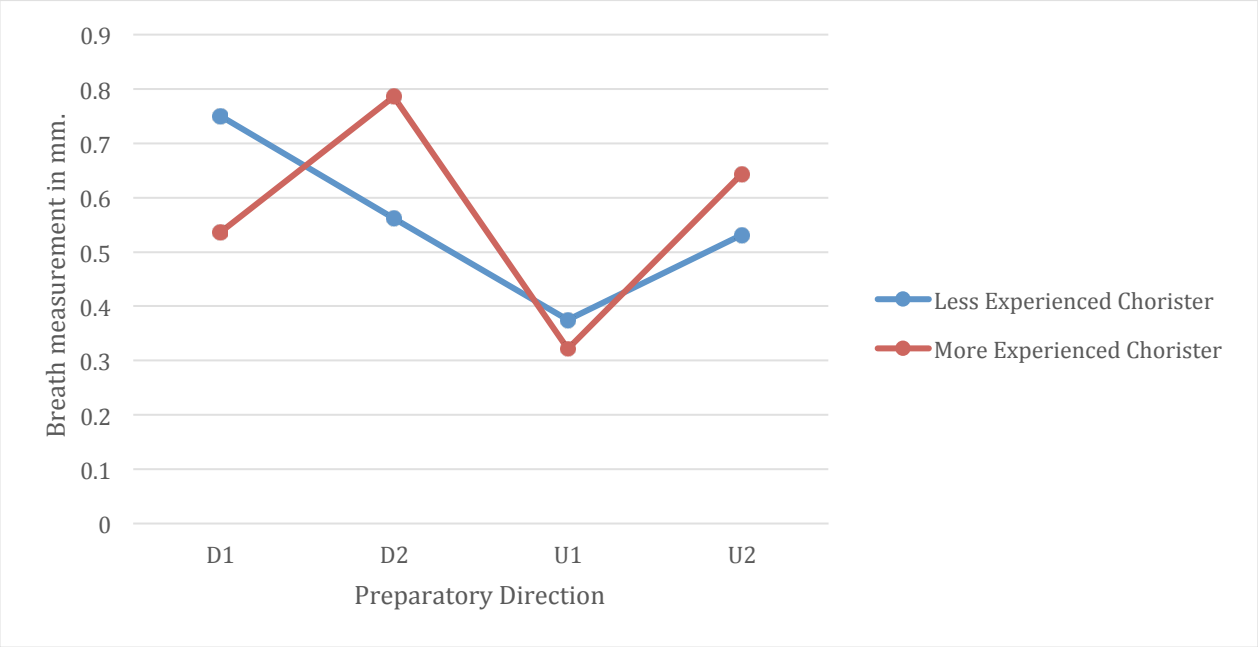

Figure 9. Average abdominal measurement by choral experience.

Note: D = downward preparatory gesture, U = upward preparatory gesture

As shown in figure 10, less experienced choristers averaged smaller abdominal measurements on downward preparatory gesture 2 and upward preparatory gesture 1. Results

indicated consistently larger gaps of differences between less and more experienced choristers in the downward preparatory breath than the upward. More experienced choristers also demonstrated a larger breath measurement on the second preparatory breath in both the upward and downward directions, while less experienced choristers showed only a larger breath measurement on the second upward preparatory gesture.

To further disaggregate breath measurement data, the researcher compared results of breath measurement while observing the four preparatory gesture directions by sex. Figure 10 displays average abdominal measurement by sex.

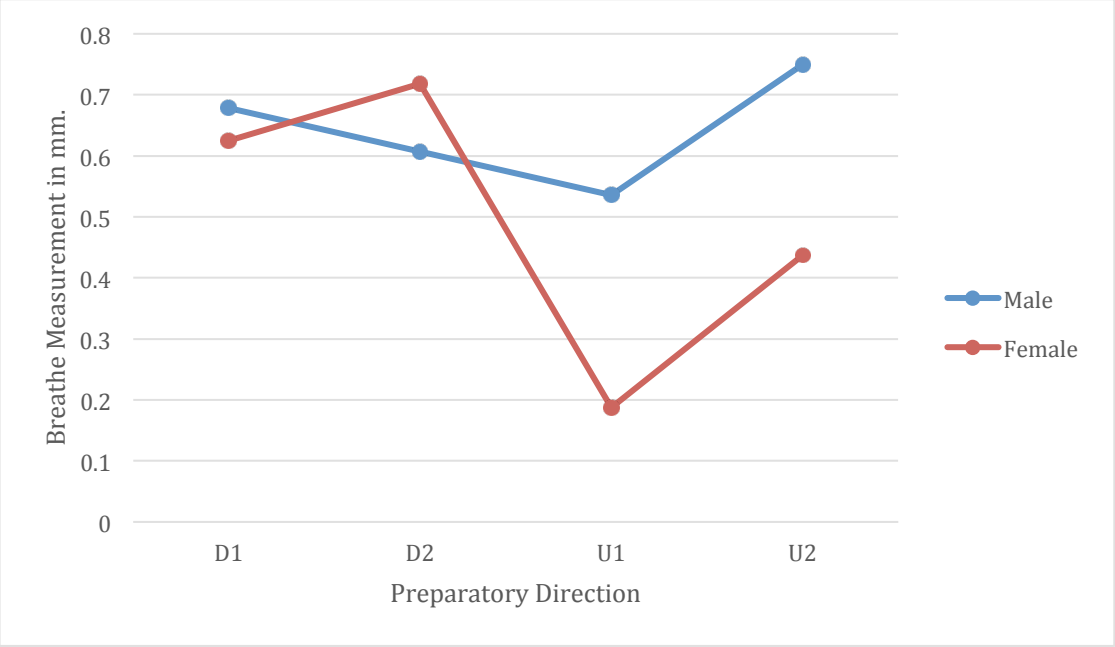

Figure 10. Average abdominal measurement by sex.

Note: D = downward preparatory gesture, U = upward preparatory gesture

As shown in figure 10, males (*n*=14) displayed a fairly consistent abdominal expansion measurement across both directions and reiterations of the preparatory gesture. Females (*n*=16) exhibited larger measurements while watching downward preparatory gestures compared to

upward. Overall, males showed larger average measurements on all preparatory breaths except the second downward preparatory gesture.

The researcher also investigated whether previous knowledge of diaphragmatic breathing influenced the breath measurement of singer participants. Figure 11 displays breath measurement results of participants and knowledge of diaphragmatic breathing.

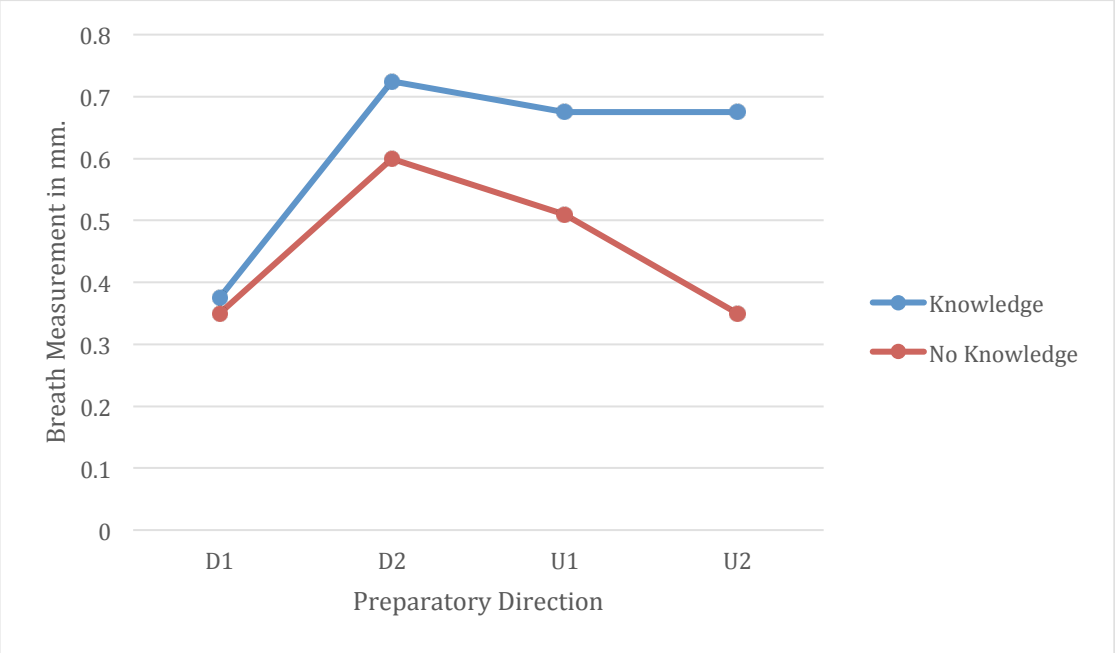

Figure 11. Knowledge vs. no knowledge of diaphragmatic breathing.

Note: D = downward preparatory gesture, U = upward preparatory gesture

As shown in figure 11, results demonstrate larger average abdominal measurements while observing all preparatory gestures for participants with knowledge of diaphragmatic breathing. The following are grand means: first downward preparatory gesture (knowledge, *M*=0.375; no knowledge, *M*=0.35), second downward preparatory gesture (knowledge, *M*=0.725; no knowledge, *M*=0.6), first upward preparatory gesture (knowledge, *M*=0.675; no knowledge, *M*=0.51), second upward preparatory gesture (knowledge, *M*=0.675; no knowledge, *M*=0.35).

Research Question Three: Questionnaire Responses

The third research question inquired about comparisons between participant questionnaire responses and measurement of lateral abdominal expansion. Thirty-three percent of participants (n = 10) responded that they did not notice a difference in the conductor videos. Of the participants that responded they did notice a difference (n = 10), only one participant answered that they noticed a difference in the way the conductor moved her hands. The rest of the responses that noticed a difference, either stated personal reflections, "I was more confident each time," or wrote of volume changes between the four videos.

When responding to the questionnaire item "What do you know about diaphragmatic breathing," 33% of participants (n = 10) answered "nothing." The rest of the responses included knowledgeable comments such as, "stomach expansion, not using shoulders," "breathing by expanding your lower body," and "breath from your tummy to get a better sound."

CHAPTER 5

Discussion

This investigation builds on a small group of studies to date that examine potential effects of non-verbal conducting gestures and their effect on individual singers (Daugherty and Brunkan, 2013; Fuelberth, 2003a, 2003b, 2004; Galops, 2005; Grady, 2013, 2014; Manternach, 2012,; Price, Mann, and Morrison, 2016; Silvey and Koerner, 2016). This chapter presents the data represented in this investigation and offers protocols that may inform the direction of future research.

Among primary findings: (a) results show a difference in abdominal measurement, although not significant, between breaths taken while observing upward and downward conductor preparatory gestures; (b) there is no significant overall difference in measurement of abdominal expansion when examining participant results; and (c) participants with knowledge of diaphragmatic breathing had consistently larger abdominal measurements than participants with little to no knowledge.

Research Question One: Direction of Preparatory Gesture

Some pedagogues tout that breathing is a foundation of singing (Thorpe, Cala, Chapman, and Davis, 2001), because of this claim, the initial breath of the singer is important. Research is needed to provide choral conductors with information regarding whether or not their gesture is encouraging a wide enough diaphragmatic breath to ensure a solid foundation of sound.

Results indicate a non-significant difference in abdominal expansion measurement between viewing the upward or downward preparatory gesture. While viewing the upward preparatory gesture, results indicate a slightly greater average abdominal measurement. This

finding could encourage possibilities of further research. Expanding the number of participants, age levels, and variety of schools would create a larger sample of data for future research.

Research Question Two: Abdominal Measurement

Question two inquired if there was a difference in abdominal expansion measured in millimeters while participants sang observing the upward or downward preparatory gesture. Although not significant, results showed participants measured relatively consistently with each breath they took before singing under both of the preparatory gestures.

Participant sex. Of possible interest, male participants consistently display larger abdominal growth measurements from beginning point to endpoint of the breath for both the upward and downward preparatory gesture when compared to female participants in three out of the four categories. Female participants show a larger abdominal measurement while viewing the downward preparatory gesture than while viewing the upward preparatory gesture. Female participants also tended to increase the abdominal measurement while viewing the second preparatory gesture of each direction (upward, downward).

There could be multiple explanations for these findings. With the amount of peer pressure students encounter, females may feel a greater amount of body insecurity about the abdomen area and this may cause females to feel uncertain about diaphragmatic breathing. A confounding variable may be the binder clip that the investigator placed on the participant's shirt to tighten the slack for a more accurate measurement. The tight clothing may have increased any pre-existing insecurities of a participant and caused a less accurate measurement of growth. Future research may explore other ways to measure growth without clipping the participant's shirt and making them aware of possible insecurities. An added question on the participant's questionnaire could

be rating their comfort on a scale of their abdominal region, so the researcher could consider these variables.

Participant experience. According to previous investigations (Thomassoon and Sundberg 2001; Griffin, Woo, Colton, Casper, and Brewer, 1995) diaphragmatic breathing is considered a desirable trait in trained singers. A perception may exist that more experienced singers have a more secure diaphragmatic breath when compared to less experienced singers. Within this investigation, data showed that participants with knowledge of diaphragmatic breathing demonstrated consistently larger abdominal measurements than participants with little to no knowledge. However, participants with more experience in choir had no significant difference than participants with less experience.

Further research might explore a larger variety of age differences and an even greater variation of choral experience. One might even compare the abdominal measurement of middle school students to college level students.

Students enrolled in the same choral program with the same instructor, grades 7-12 comprised this investigation. This could be a confounding variable due to students having been taught by the same music educator. Further research might explore different teaching experiences by examining students enrolled in various public schools and colleges.

Conductor stimulus video. In the conductor stimulus video, the researcher utilized one of two direction hand gestures as the preparatory gesture while opening her mouth to demonstrate when to breathe. During this breath, she did not move her upper body or visibly show expansion. Previous studies have found choral conducting gestures and body language to cause a possible mirroring effect on singers (Daugherty and Brunken, 2013; Manternach, 2012). Due to the conductor opening her mouth while breathing, participants may have automatically

opened their mouths in a similar fashion mirroring the behaviors of the conductor. In addition, some participants may have become focused on the open mouth, instead of the preparatory hand gesture.

A small group of research studies have investigated mirroring in a non-musical setting, (Skipper, Goldin-Meadow, Nusbaum, Small, 2007; Blum, 2015). These studies reflect that mirroring is effective in teaching a physical technique such as breathing. However, researchers reflect that when a gesture is associated with a function, the brain processes the concept that has already been taught and does not process the gesture associated.

A series of studies (Daugherty and Brunken, 2013; Grady, 2013, 2014; Manternach, 2012) have examined conducting gestures and found that gestures affect a singer's performance based on that gesture. Although Grady (2013, 2014) investigated the effects different conductors had on each performance in a choral setting, future research may go even further into analyzing individual singers with various conductors.

Another future investigation could be evaluating the intonation of those individual singers on the very first pitch after the preparatory breath. The preparatory gestures and study design could be of similar nature to this one, but using data to analyze the first pitch and evaluate which gesture caused more 'in tune' singing.

Conclusion

The data in this investigation invites exploration of future studies in a similar context. In particular, some data from this study appear to suggest there is a small difference in abdominal breath measurement when categorized by participant sex. There is also a relationship between knowledge of diaphragmatic breathing and efficient singer breath.

The topic of ‘diaphragmatic breathing’ can and should be further explored. Results of such research would be beneficial to choral educators and conductors. Perhaps the primary take away from this investigation is that we need more exploration into choral conducting gestures and how gestures may affect choir or individual singer sound. Rodney Eichenberger stated, “virtually all gestures can help a conductor, so I encourage students to isolate each movement and then to discover its effect in the musical performance. These movements can then become effective elements in the development of a conductor’s nonverbal vocabulary” (McClung, 1996 p. 24).

References

Alt, D. (March 1990). Misunderstanding breath "support" for singers. *The Choral Journal.* 30(8), 33-35. Retrieved from http://www.jstor.org/stable/23547635

Blum, M. C. (2015). Embodied mirroring: A relational, body-to-body technique promoting movement in therapy. Journal of Psychotherapy Integration. 25(2), 115-127.

Bonner, D. J. (2009). Non-verbal language, gesture, and the choral conductor (Doctoral Dissertation). Retrieved from ProQuest Dissertations Publishing. (3361803).

Bowen, J. A. (2003). The rise of conducting. In J. A. Bowen (Ed.), *The cambridge companion to conducting* (pp. 93-113). Cambridge, UK: Cambridge University.

Byo, J. L. (1990). Recognition of intensity contrasts in the gestures of beginning conductors. *Journal of Research in Music Education, 38,* 157-163.

Christy, V. A. (1965). *Foundations in Singing.* Debuque, Iowa: Wm. C. Brown CO. INC.

Cofer, R. S. (1998). Effects of conducting-gesture instruction on seventh-grade band students' performance response to conducting emblems. *Journal of Research in Music Education,* 46, 360-373.

Con, A. J. (2002). The life and philosophy of choral conductor Rodney Eichenberger, including a detailed analysis and application of his conductor-singer gestures. (Doctoral Dissertation). Florida State University.

Cottrell, D. (April 2010). Support or resistance? Examining breathing techniques in choral singing. Choral Journal. 50(9), 53-59.

Daugherty, J. F. (2013). Monkey see, monkey do? The effect of nonverbal conductor lip rounding on visual and acoustic measures of singers' lip postures. Journal of Research in Music Education. 60(4), 345-362. doi: 10.1177/0022429412464039

Dayme, M. B. (2009). Dynamics of the Singing Voice: 5th edition. Austria: Springer-Verlag Wien New York.

Deidre, M. (May/June 2010). Dispelling vocal myths. Part 1: "Sing from your diaphragm!". *Journal of Singing.* 66(5), 547-551.

Durrant, C. (November 2009). Communicating and accentuating the aesthetic and expressive dimension in choral conducting. *International Journal of Music Education.* 27(4), 326-340. Doi: 10.1177/025576149344374

Eichenberger, R. B. (Producer), & Dunn, M. (Director). (1994). *What they see is what you get* [Motion Picture]. North Carolina: Hinshaw.

Ford, J. K. (2001). Implications for non-verbal communication and conducting gesture. *Choral Journal, 42*(1), 17-23. Retrieved from http://search.proquest.com.www2.lib.ku.edu/docview/1032239?accountid=14556

Fregosi, R. F. & Ludlow, C. L. (February 2014). Activation of upper airway muscles during breathing and swallowing. *Journal of Applied Physiology*. 116(3), 291-301. doi: 10.1152/japplphysiol.00670.2013

Fuelberth, R. J. V. (2003a). The effect of conducting gesture on singers' perceptions of inappropriate vocal tension. *International Journal of Research in Choral Singing, 1,* 13- 21.

Fuelberth, R. J. V. (2003b). The effect of left hand conducting gesture on inappropriate vocal tension in individual singers. *Bulletin of the Council for Research in Music Education, 157*, 62-70.

Fuelberth, R. J. V. (2004). The effect of various left hand on conducting gestures on perceptions of anticipated vocal tension in singers. *International Journal of*

Research in Choral Singing, 2, 27-38.

Gallops, R. W. (2005). *The effect of conducting gesture on expressive-interpretive performance of college music majors.* (PhD Dissertation). Retrieved from ProQuest Dissertations and Theses. (Accession Order No. AAT 3188406).

Goldfried, M. R., & Davison, G. C. (1976). Clinical behavior therapy. New York: Holt Rinehart and Winston.

Grady, M. L. (2013). Effects of nonverbal gestures exhibited by multiple conductors on acoustical, visual, and psychoacoustical measures of choral music-making: A collective case study. Unpublished manuscript, University of Kansas.

Grady, M. L. (2014). The effects of nonverbal behaviors exhibited by multiple conductors on the timbre, intonation, and perceptions of three university choirs, and assessed relationships between time spent in selected conductor behaviors and analyses of the choirs' performances (Doctoral Dissertation). Retrieved from KU ScholalWorks.

Green, E. A. H. (1981). *The modern conductor* (3rd ed.). Englewood Cliffs, NJ: Prentice Hall.

Goffi-Fynn, J. C. & Carroll, L. M. (May 2013). Collaboration and conquest: MTD as viewed by voice teacher (singing voice specialist) and speech-language pathologist. *Journal of Voice*. 27(3), 391-396. doi: 10.1016/j.jvoice.2012.12.009

Graham, E. (2014). *The role of laryngeal function in breathing for singing*. ProQuest Dissertations & Theses Global. (1629429739). Retrieved from http://search.proquest.com.www2.lib.ku.edu/docview/1629429739?accountid=14556

Griffin, B., Woo, P., Colton, R., Casper, J., Brewer, D. (1995). Physiological Characteristics of the supported singing voice. A Preliminary Study. *Journal of Voice*. 9(1) 45-56.

Kelly, S. N. (1997). Effects of conducting instruction on the musical performance of beginning band students. *Journal of Research in Music Education, 45,* 295-305.

Kilburn, K. M. (2016). Pedagogical approaches to conducting gesture in contemporary music. Retrieved from ProQuest Dissertations & Theses Global. (1828899925).

Leanderson, R., Sundberg J., von Euler C. (January 1987). Role of diaphragmatic activity during singing: a study of transdiaphragmatic pressures. *Journal of Applied Physiology*. 62(1), 259-270.

Manternach, J. N. (2009). The effect of conductor head and shoulder movement and preparatory gesture direction on upper body movement of individual singers (Masters Thesis). Retrieved from ProQuest Dissertations Publishing. (1465037).

Manternach, J. N. (2012). Effects of conductor preparatory arm, head, and hand movements on singer extrinsic laryngeal muscle engagement and voicing behaviors. (Doctoral Dissertation). Retrieved from ProQuest Dissertations Publishing. (3524112).

McClung, A. C. (May 1996). The Relationship between Nonverbal Communication and Conducting: An Interview with Rodney Eichenberger. *The Choral Journal*. 36(10), 17-24.

McKinney, J. C. (2014). *The Diagnosis & Correction of Vocal Faults: a manual for teachers of singing & for choir directors*. Long Grove, IL: Waveland Press, Inc.

McMillan, B. (2006). *Human Body: a visual guide.* Buffalo, NY: Weldon Owen Inc.

Meisner, G. (2004). PhiMatrix (1.618) [Computer software]. PhiPoint Solutions, LLC. Available from www.phimatrix.com

Miller, R. (January 1997). Spreading the upper back for “breath support”. *Journal of Singing – The Official Journal of the National Association of Teachers of Singing* 53(3), 29-30.

Morrison, S. J. & Selvey, J. D. *(*Winter 2014). The effect of conductor expressivity on choral ensemble. *Bulletin of the Council for Research in Music Education.* 199. 7-18.

Novotny, S. (February 2007). The science of breathing: It's more than automatic. *Idea Fitness Journal*. 4(2) 36-43.

Pettersen, V. (December 2005). Muscular patterns and activation levels of auxiliary breathing muscles and thorax movement in classical singing. *Folia phoniatrica et logopaedica*. 57(5-6), 255-277. doi: 10.1159/000087079

Preparatory. (2016). Merriam-Webster Dictionary Online. https://www.merriam-webster.com/dictionary/preparatory

Price H. E., Mann A., Morrison S. J. (2016). Effect of conductor expressivity on ensemble evaluations by nonmusic majors. *International Journal of Music Education*. 34(2), 135-142.

Saladin, K. S. (2010). *Anatomy & Physiology: the unity of form and function*. New York, NY: McGraw-Hill Companies Inc.

Salomoni, S., van den hoorn, W., Hodges, P. (2016). Breathing and singing: Objective characterization of breathing Patterns in classical singers. *PloS one.* 11(5). doi: 10.1371/journal.pone.0155084

Sears, T. A. (1977). Some neural and mechanical aspects of singing. London: Heinemann Medical Books.

Seighman, G. B. (April 2015) Exploring the science of ensemble gestures, emotion, and collaboration in choral music making. *Choral Journal*. 55(9), 8-16. ISSN: 00095028.

Sidoti, V. J. (1990). *The effects of expressive and nonexpressive conducting on the performance accuracy of selected expression markings by individual high school*

instrumentalists (PhD Dissertation). Retrieved from ProQuest Dissertations and Theses. (Accession Order No. AAT 9105212).

Silvey, B. A., Koerner B. D. (2016). Effects of conductor expressivity on secondary school band members' performance and attitudes toward conducting. *Journal of Research in Music Education*, 64(1), 29-44.

Skadsem, J. A. (1996). The effect of verbal, written, gestural, and choral stimuli on singers' performance responses to dynamic changes in music. *Missouri Journal of Research in Music Education, 33*, 28-44.

Skadsem, J. A. (Winter 1997). Effect of conductor verbalization, dynamic markings, conductor gesture, and choir dynamic level of singers' dynamic responses. Journal of Research in Music Education. 45(4), 509-520. http://www.jstor.org/stable/3345419

Skipper J. L., Goldin-Meadow S., Nusbaum H. C., Small S. L. (2007). Speech-associated gestures, Broca's area, and the human mirror system. *Brain and Language*. 101(3), 260-277.

Sonninen, A., Laukkanen, A. M., Karma, K., Hurme, P. (June 2005). Evaluation of support in singing. *Journal of Voice.* 19(2), 223-237. doi: 10.1016/j.jvoice.2004.08.003

Tamplin, J., Brazzale, D. J., Pretto, J. J., Ruehland, W. R., Buttifant, M., Brown, J. D., Berlowitz, D. J. (February 2011). Assessment of breathing patterns and respiratory muscle recruitment during singing and speech in quadriplegia. *Archives of physicalmedicine and rehabilitation*. 92(2), 250-256.

Thomassoon, M. & Sundberg, J. (2001). Consistency of inhalatory breathing patterns in professional operatic singers. *Journal of Voice.* 15(3), 373-383. doi: 10.1016/S0892-1997(01)00039-X

Thorpe, W. C., Cala, S. J., Chapman, J., Davis, P. J. (2001). Patterns of breath support in projection of the singing voice. *Journal of Voice.* 15(1), 86-104. doi: 10.1016/S0892-1997(01)00009-1

Xi, J., Si, X., Kim, J., Su, G., Dong, H. (2014). Modeling the pharyngeal anatomical effects on breathing resistance and aerodynamically generated Sound. *Medical & Biological Engineering & Computing*. 52(7), 567-577. doi: 10.1007/s11517-014-1160-z

Appendix A

Human Research Subjects Approval Letter

THE UNIVERSITY OF KANSAS
Research

APPROVAL OF PROTOCOL

April 11, 2017

Emily Stefan
emjade@ku.edu

Dear Emily Stefan:

On 4/11/2017, the IRB reviewed the following submission:

Type of Review:	Initial Study
Title of Study:	THE EFFECT OF CONDUCTOR PREPARATORY GESTURE DIRECTION ON DIAPHRAGMATIC BREATHING OF INDIVIDUAL SINGERS
Investigator:	Emily Stefan
IRB ID:	STUDY00140671
Funding:	None
Grant ID:	None
Documents Reviewed:	• ES consent form.doc, • E Stefan Assent form, • E Stefan Submission form, • Questionaire/survey, • Questionaire/survey

The IRB approved the study on 4/11/2017.

1. Notify HSCL about any new investigators not named in original application. Note that new investigators must take the online tutorial at https://rgs.drupal.ku.edu/human_subjects_compliance_training.
2. Any injury to a subject because of the research procedure must be reported immediately.
3. When signed consent documents are required, the primary investigator must retain the signed consent documents for at least three years past completion of the research activity.

Continuing review is not required for this project, however you are required to report any significant changes to the protocol prior to altering the project.

Please note university data security and handling requirements for your project:
https://documents.ku.edu/policies/IT/DataClassificationandHandlingProceduresGuide.htm

You must use the final, watermarked version of the consent form, available under the "Documents" tab in eCompliance.

Sincerely,

Stephanie Dyson Elms, MPA
IRB Administrator, KU Lawrence Campus

Human Research Protection Program
Youngberg Hall | 2385 Irving Hill Rd | Lawrence, KS 66045 | (785) 864-7429 | research.ku.edu/hrpp

Appendix B

Assent Form

My name is Emily Stefan. I am interested learning about preparatory conductor gesture and the impact on the individual singer because I am currently working on my Masters degree. If you would like, you can be in my study. I would like you to take part by performing the following task one time. This task would include singing *America* four times in a row while watching a videotaped conductor. This would also include you wearing stickers on your abdominal region, and some binder clips on the back of your shirt, while being video-taped. You will then complete a survey about your experience and previous music experiences.

If you decide you want to be in my study, you will first need a parent/guardian to complete the consent form attached. Then you will make an appointment with me to complete the study.

Other people will not know if you are in my study. I will put things I learn about you together with things I learn about other students so no one can tell what things came from you. When I tell other people about my research, I will not use your name, so no one can tell whom I am talking about.

Your parents or guardian have to say it's OK for you to be in the study. After they decide, you get to choose if you want to do it too. If you don't want to be in the study, no one will be mad at you. If you want to be in the study now and change your mind later, that's OK. You can stop at any time.

If you don't feel like completing the study or survey, you don't have to, and you can stop singing at any time and that would be alright. I will be happy to answer any questions you may have now or when we are talking together. Do you want to take part in this project?

Thank you,

Emily Stefan

Appendix C

Consent Form

THE EFFECT OF CONDUCTOR PREPARATORY GESTURE DIRECTION ON DIAPHRAGMATIC BREATHING OF INDIVIDUAL SINGERS

INTRODUCTION

The Department of Music Education at the University of Kansas supports the practice of protection for human subjects participating in research. The following information is provided for you to decide whether you wish your child to participate in the present study. You may refuse to sign this form and not allow your child to participate in this study. You should be aware that even if you agree to allow your child to participate, you are free to withdraw at any time. If you do withdraw your child from this study, it will not affect your relationship with this unit, the services it may provide to you, or the University of Kansas.

PURPOSE OF THE STUDY

To study the effects of conductor preparatory gesture direction on measurement of lateral abdominal expansion of individual teenage singers.

PROCEDURES

You will be asked to sing *America* four times. You will be viewing a videotaped conductor while being videoed each time you sing. Your total time commitment should be less than 20 minutes

RISKS

There are no risks or discomforts associated with this study
Participation in research will not impact grades

BENEFITS

The benefits of this study will be a greater understanding of teacher methodologies on singer self-evaluation.

PAYMENT TO PARTICIPANTS

Participants will not be paid.

PARTICIPANT CONFIDENTIALITY

Your name will not be associated in any way with the information collected about you or with the research findings from this study. The researchers will use a study number or a pseudonym instead of your name. The researchers will not share information about you unless required by law or unless you give written permission.
Permission granted on this date to use and disclose your information remains in effect indefinitely. By signing this form you give permission for the use and disclosure of your information for purposes of this study at any time in the future.

REFUSAL TO SIGN CONSENT AND AUTHORIZATION

You are not required to sign this Consent and Authorization form and you may refuse to do so without affecting your right to any services you are receiving or may receive from the University of Kansas or to participate in any programs or events of the University of Kansas. However, if you refuse to sign, your child cannot participate in this study.

CANCELLING THIS CONSENT AND AUTHORIZATION

You may withdraw your consent to allow participation of your child in this study at any time. You also have the right to cancel your permission to use and disclose further information collected about your child, in writing, at any time, by sending your written request to: Emily Stefan, 1209 Cherry Goodland, KS 67735.

If you cancel permission to use your child's information, the researchers will stop collecting additional information about your child. However, the research team may use and disclose information that was gathered before they received your cancellation, as described above.

QUESTIONS ABOUT PARTICIPATION

Questions about procedures should be directed to the researcher(s) listed at the end of this consent form.

PARTICIPANT CERTIFICATION:

I have read this Consent and Authorization form. I have had the opportunity to ask, and I have received answers to, any questions I had regarding the study. I understand that if I have any additional questions about my child's rights as a research participant, I may call (785) 864-7429, write to the Human Research Protection Program (HRPP), University of Kansas, 2385 Irving Hill Road, Lawrence, Kansas 66045-7568, or email irb@ku.edu.

I agree to allow my child to take part in this study as a research participant. By my signature I affirm that I am at least 18 years old and that I have received a copy of this Consent and Authorization form.

_____ _____

Type/Print Participant's Name Date

_____

Parent/Guardian Signature

[If signed by a personal representative, a description of such representative's authority to act for the individual must also be provided, e.g. parent/guardian.]

Researcher Contact Information

Emily Stefan, Principle Investigator

1209 Cherry

Goodland, KS. 67735

Emily.Stefan@usd352.org

Dr. Melissa Grady

1530 Naismith Dr.

Lawrence, KS. 66045
mlgrady@ku.edu

Dr. Christopher Johnson
1530 Naismith Dr.
Lawrence, KS 66045
Cmj@ku.edu

Appendix D

Questionnaire

Gender: Male or Female **Age:** 12 13 14 15 16 17 18 19

Years of experience singing in choir

Less than 1 1-2 2-3 3-4 4-5 5-6 6-7 7-8 8-9 9-10

Years of experience playing in an instrumental ensemble

Less than 1 1-2 2-3 3-4 4-5 5-6 6-7 7-8 8-9 9-10

Years of experience in taking private voice lessons

Less than 1 1-2 2-3 3-4 4-5 5-6 6-7 7-8 8-9 9-10

Did you notice a difference in the four videos?

Yes No

If you noticed a difference, what was it?

What do you know about diaphragmatic breathing?