A Thesis

entitled

Effects of the Linklater Voice Training Technique on the Voices of Student Actors

by

Emily Wessendarp

Submitted to the Graduate Faculty as partial fulfillment of the requirements for the

Master of Arts Degree in Speech-Language Pathology

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August 2012
An Abstract of

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The purpose of this study was to determine if student actors who participated in a vocal training course, based on the Linklater Voice Training Technique, experienced significant changes in their voices when measured perceptually, acoustically and aerodynamically compared to other student actors who did not receive training in Linklater Voice. Four students enrolled in a vocal training course based on the Linklater Voice Training Technique were evaluated at the beginning of the semester, at a mid-training point, and again at the end of the semester. Four other acting students who were enrolled in a different acting course and did not receive training were also evaluated and served as a no treatment control group. The evaluation included completion of a screening tool, a questionnaire, and the Voice Diagnostic Protocol (Awan, 2001). Acting students who participated in the Linklater Voice Training Technique demonstrated significant increases in maximum phonation times and phonation quotients compared to the no treatment control group. Significant changes in mean speaking fundamental frequency and shimmer measures for control participants were noted.
Results suggest that the Linklater Voice Training Technique facilitated improved airflow control during sustained phonation which, in turn, may assist acting students during on stage tasks including delivering long monologues, projecting the voice throughout a performance space, and using the voice while moving in physically demanding ways. While negative effects of training were not observed in this study, the trend for shimmer to increase in the Linklater Voice Training Technique participants and to decrease significantly in those not receiving training suggests the need for careful monitoring of this variable during training. Further research using a randomized control group design with a larger number of participants and extended over a longer period is warranted to more fully assess the efficacy of the Linklater Voice Training Technique.
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Chapter One

Literature Overview

Acting is a multi-dimensional career that requires talent in both creating a character for an audience and communicating that character in an effective way. Vocally an actor is required to project and be clear in many different, usually suboptimal, settings while still creating the appropriate emotional intensity (Laukkanen, Syrja, Laitala & Leino, 2004). The typical working actor experiences demanding preparation and performances which require high levels of energy and the ability to communicate a wide range of emotion. This creates quite the demand on an actor’s voice (Raphael, 1997). A good actor requires an efficient voice that can be maintained throughout an entire career.

Many actors, directors, scientists and audiences argue whether the outstanding voice quality of a highly esteemed actor is due to the natural ability of the actor to achieve optimal voice quality, or due to skillful training with a knowledgeable voice teacher (Hollien, 1993). Hollien suggests that the extraordinary voice or “golden voice” heard in a gifted actor stems from a balance between talent and training. Trained professional voice users may attribute some of their vocal success to a good voice education approach (Hollien, 1993). Voice training is used to enhance an actor’s voice to fit the demands of the stage including increased projection, clarity and emotional range (Timmermans, De Bodt, Wuyts, & Van de Heyning, 2004).

According to Roy, Ryker and Bless (2000), vocal experts and acting teachers have worked to develop safe approaches that provide actors with the vocal characteristics needed for the stage. Experts differ in their methods, but most approaches used in English speaking countries hold the common ties of providing education of basic anatomy and
physiology of the vocal mechanism, relaxing the muscles in the body, creating an open jaw and pharynx, managing diaphragmatic breathing, using a forward tonal focus, reducing a hard glottal attack, and facilitating appropriate pitch, loudness, and quality (Freed, Raphael & Sataloff, 1997; Roy et al., 2000). Most approaches use techniques to help each actor develop awareness of body posture and use laryngeal exercises to release the voice and eliminate any strain (Roy, Ryker & Bless, 2000). Some of these training approaches center on the idea that each person possesses the ability for optimal voice use. While the majority of notable developers of vocal training approaches for actors share these common principles, each developer incorporates his or her individual views on effective vocal use into his or her own distinctive approach.

Examination of specific vocal training approaches for actors suggests a major theme—freedom. For example, pioneer and world-renowned voice and text coach, Cicely Berry, teaches that the voice is conditioned by four factors—environment, perception of sound, physical agility, and one’s personal interpretation of the previous three factors. Through her series of exercises, an actor learns to balance the truth of his free voice and to use it to project feelings through the acting space (Berry, 1973). Similarly, Arthur Lessac, developer of the Lessac Kinesthetic Training, taught his students, actors and singers alike, to achieve vocal freedom through kinesthetic awareness and to learn to discover and enjoy the sounds produced by the voice (Freed et al., 1997). Lessac (1967) writes that physical sensation is the basis of his work in voice and speech. He explores how the body would naturally function in the absence of adverse conditioning, and asks his students to create these natural sounds with reduced physical tension and stress. He also teaches the production of a relaxed voice through a series of physical exercises.
Patsy Rodenburg, master voice and Shakespeare teacher, encourages every communicator to find vocal freedom and to declare his or her vocal rights. Rodenburg encourages her students to discover their vocal rights through exercises aimed at identifying and releasing any habits and discovering vocal personality (Rodenburg, 1992).

Other actors and professional voice users have learned to benefit through popular movement techniques such as the Alexander Technique and The Feldenkrais Method (Freed, 1997). Barlow (1973) writes that principles of the Alexander Technique state, “there are certain ways of using your body which are better than certain other ways; that when you reject these better ways of using your body, your functioning will begin to suffer in some important respects” (p. 4). Actors’ primary instruments are their bodies and their voices. According to the Alexander Principle, if an actor does not use his body in an optimal way, then his performance may suffer, possibly in his voice. Actors use the Alexander Technique to develop knowledge of using the body to improve their performance both physically and vocally.

Moshe Feldenkrais also developed a kinesthetic technique to help increase self-discovery by achieving awareness through movement and functional integration. Feldenkrais uses physical exercises to help individuals discover better ways to perform any physical function (Nelson & Blades-Zeller, 2002). Many actors and singers have used Feldenkrais’ theories and exercises to improve vocal functions.

Kristen Linklater (2006), developer of the Linklater Voice Training Technique, says that her approach “is designed to liberate the natural voice and thereby develop a vocal technique that serves the freedom of human expression” (p.7). Linklater’s work is
based on the idea that every human being is born with a fully functional, natural voice which becomes compromised by habits as individuals try to communicate with the world. To be an efficient voice user, human beings should reconnect with the infantile natural function of the voice (Linklater, 1992). Linklater writes that there are two basic assumptions of the Linklater Voice Training Technique. The first is that each person possesses a two-to four-octave natural pitch range in which one expresses all moods, emotions and experiences. Secondly, each person acquires tension as a result of existing in the world and experiencing negative reactions to the environment. These negative reactions and resulting tensions impede the effectiveness of the natural voice and communication in general (Linklater, 2006). In *Freeing the Natural Voice* (2006), Linklater writes that the purpose of the Linklater Voice Training Technique is to produce voice that is in direct contact with the body’s natural impulses. This natural voice possesses innate potential for a wide pitch range, intricate harmonies, and colorful textual qualities that translate into clear speech and a strong desire to communicate (Linklater, 2006).

To achieve this free, natural voice through the reduction of bad habits requires actors to recondition the way they communicate. Linklater (2006) writes that, “perfect communication demands from the actor a balanced quartet of emotion, intellect, body and voice” (p. 9). This begins with physical awareness, relaxation of the body, and breathing awareness. Awareness of the physical body and breath allow for a free channel for sound and emotion to travel. Through a series of exercises, or warm up, the Linklater Voice Training Technique works to create freedom in all the muscles of the body including those needed for standing, walking, bending, and especially those needed to produce
voice and speech. The warm up exercises focus on the way the body and voice are naturally used as opposed to focusing on imitation or artificially creating sound. As the exercises in Linklater Voice continue, students learn to shape the rediscovered natural sound to achieve forward vocal projection of text with clarity and emotion to draw in an audience (Linklater, 2006). Actors are encouraged to commit to a lengthy period of study and practice to allow the Linklater exercises to affect the voice.

In summary, many approaches to vocal training for actors and students of acting have been developed. These approaches share many common characteristics, but also differ in a number of respects. While all of these approaches have their advocates, very little systematic research has been conducted to document the effects of these training approaches on the actual voice production of those who receive training.

Although little research is available on effects of specific well known approaches, existing research has documented outcomes of more general and “eclectic” approaches to vocal training particularly for students of acting. Past research studies investigating the effectiveness of vocal training approaches for student actors have shown that vocal training that includes relaxation, natural body posture and healthy breathing can lead to positive changes in acoustic, aerodynamic, and self-perception measures of voice. An analysis of student actors’ voices completed by Feudo, Harvey and Aronson (1992) sought to determine if acoustic and aerodynamic aspects of the voice changed over time for students who completed coursework for a Masters of Fine Arts in acting.

Feudo et al. completed electroacoustic voice assessments with 44 acting students on two to four occasions at 9-12 month intervals during the students’ completion of their university M.F.A. acting programs. No specific vocal training approach was identified by
the authors. Rather, this study investigated the changes in the students’ voices after they completed an entire program of study as acting students. Feudo et al. (1992) measured maximum phonation time (MPT), frequency range, mean fundamental frequency ($F_0$) and mean speaking intensity in tasks including oral reading, rehearsed script and monologues to analyze actors’ voices across a training period and explore the usefulness of these measures to reveal change over time (see Appendix C for further description of these measures). A comparison of participants’ pre-training and post-training measures indicated significant increases in frequency range as well as MPT. According to Feudo et al., the observed increased MPT allows for increased respiratory control and phonatory endurance. An actor may require this control and endurance that comes with increased pitch range and MPT to project his or her voice throughout a space and performance.

Timmermans, De Bolt, Wuyts and Van de Heyning (2004) list the goal of voice training as giving the individual techniques to optimize the voice to create a clear sound capable of filling a large space. They followed 49 audiovisual communication students including student actors, musicians and radio presenters through a voice training protocol for 9 months. The voice training protocol was presented in technical workshops 2 hours a week and focused on relaxation, natural posture and healthy breathing. A second group of 19 directing students did not receive any voice training and acted as a control group. The authors administered the Grade, Roughness, Breathiness, Asthenia, Strain Scale voice assessment, or GRBAS scale, to obtain perceptual measures of the participants’ voice qualities, the Dysphonia Severity Index (DSI) to obtain an overall measure of acoustic characteristics of participants’ voice qualities, and the Voice Handicap Index (VHI) to evaluate the psycho-social impact of the voice as reported by the participants. Results
indicated voice improvements following training as reflected by significant changes in DSI and VHI scores of participants receiving training compared to those who did not (Timmermans et al., 2004).

In a follow-up study, similar to the 2004 study, Timmermans, De Bodt, Wuyts and Van de Heyning (2005), followed 23 acting and radio presenting students through a 2 year voice training approach. This study also included an additional 30 hours of vocal hygiene education. Again the authors used the GRBAS scale, DSI and VHI to determine change over treatment time; they also included a daily habits questionnaire. Comparison of pre-training and post-training measures indicated statistically significant improvements in elements of the DSI and VHI. These results are consistent with the previous study conducted by the same authors. These findings led the authors to conclude that a well-organized voice training program that includes lectures on anatomy and physiology of the voice, vocal hygiene, and diction, along with physical relaxation, natural posture, and healthy breathing can improve voice quality for those receiving training (Timmermans et al., 2005).

Walzak, McCabe, Madill and Sheard (2008) investigated the acoustic changes in student actors’ voices after 12 months of vocal training. These researchers implemented an eclectic voice program that used a variety of principles taken from various well known approaches including the ideas of Berry (1973) and Rodenburg (1992). In this study, eighteen acting students participated in three 16 week sessions that included daily voice classes that focused on diaphragmatic breathing and forward focus. Walzak et al. (2008) used a variety of acoustic measures to assess changes in students’ voices. These included
mean fundamental frequency ($F_0$) in reading and sustained vowel measures, $F_0$ frequency range, jitter, shimmer, noise to harmonic ratio (NHR), and MPT.

Through comparisons of pre-training and post-training measures, the authors concluded that vocal training increased the frequency ranges in the student actor participants (Walzak et al., 2008). Frequency range refers to the span between the lowest frequency in one’s modal, or chest, register to the highest frequency in one’s falsetto register (Awan, 2001). Increased frequency range is ideal, as actors with more vocal flexibility have more flexibility for creating certain sounds and feelings needed for a piece (Chow, 2006).

The studies discussed above have provided information regarding the effects of general educational programs or eclectic vocal training approaches on the voices of student actors. While these studies offer support for the importance of vocal training, several methodological issues limit conclusions that can be drawn from the findings of these studies. Descriptions of the actual training provided to student actors varied greatly and lacked detail, making replication of the training difficult. With the exception of one study, Timmerman et al. (2004), these studies have not included control groups, making it difficult to attribute voice changes to the training programs. Additionally, participants included in these studies have varied considerably, particularly in the sense that some studies included individuals with voice disorders, while others did not.

Beyond methodological limitations, available research in the area has been somewhat limited in scope. As noted previously, for example, there has been little research on the effects of well-known vocal training approaches whose protocols are widely accepted by the acting community and many university theatre programs. To
begin to address this gap in the literature, this preliminary study was completed to determine if student actors with normal voices who participated in a vocal training course, based on the Linklater Voice Training Technique, experienced significant changes in their voices when measured perceptually, acoustically and aerodynamically compared to other student actors who did not receive training in the Linklater Voice Training Technique.
Chapter Two

Method

Participants

Participants for this study were recruited from students enrolled in two courses in the University of Toledo’s Department of Theatre and Film: THR 2640 Voice and Movement and THR 2200 Perspectives of Theatre. Students in these courses are similar in a number of respects, except that students in Voice and Movement receive vocal training based on the Linklater Voice Training Technique and those in Perspectives of Theatre receive information relevant to their major but do not receive vocal training.

A total of 24 students agreed to participate. These 24 included all of the 8 students enrolled in the Voice and Movement Class, THR 2640, and all of the 16 students enrolled in THR 2200 Perspectives of Theatre. To be selected to participate in this study, individuals consenting to participate were required to pass voice, speech and hearing screenings indicating that these areas were within normal limits. This study used only individuals with normal voices in order to maintain reasonable homogeneity in vocal characteristics of the participants.

Of the 24 students who initially agreed to participate, a total of 13 were determined by consensus of two certified speech language pathologists to have voices that fell within normal limits; eleven students were determined to have voices that were not within normal limits. These determinations were made by the speech language pathologists based on observing screening sessions involving the administration of the Quick Screen for Voice (Lee, Stemple, Glaze & Kelchner, 2004) by the graduate student researcher (see Appendix A).
Of the 13 participants who passed the screening, 5 (4 males and 1 female) were from the Voice and Movement course and 8 (4 males and 4 females) were from the Perspectives of Theatre course. Considering the fact that only one female with a voice within normal limits remained in the Voice and Movement group, the data analysis to address the main research question was based on a comparison of the 4 males from the Voice and Movement (experimental) group and the 4 males from the Perspectives of Theatre (control) group with voices that were within normal limits perceptually.

The four participants selected for the experimental group ranged in age from 20 to 22 years old (Mean age=21, SD= 0.96). This group ranged in height from 69-74 inches (Mean height=71”, SD=2.45) and in weight from 152-280 pounds (Mean weight=210.5 lbs., SD=52.80). The four participants selected for the control group were between the ages of 18 and 23 (Mean age=20, SD=2.45). This group ranged in height from 70-72 inches (Mean height=71.25”, SD=0.96) and in weight from 135-210 pounds (Mean weight=170 lbs., SD=30.82). The differences between the mean height and weight among the experimental and control groups were not statistically significant (height $p = 0.854$; weight $p =0.281$), showing that these two groups are relatively homogenous in terms of age, height and weight.

**Linklater Voice Training Technique**

Participants in the Linklater Voice Training Technique experimental group were students enrolled in THR 2640. The course, THR 2640 Voice and Movement, introduced students to the principles of the Linklater Voice Training Technique. The course instructor received extensive training in the Linklater Voice Training Technique under
Kristin Linklater and believes it to be beneficial preparation for any student actor. Voice and Movement is the only course primarily devoted to voice training offered for acting students at the University of Toledo as part of the requirements for a degree in theatre.

The Voice and Movement course held at the University of Toledo aims to give student actors the basic knowledge and principles presented in the Linklater Voice Training Technique as part of their training in the theatre degree program. Due to the short length of the course, the instructor was unable to spend the same amount of time and study on each exercise as Linklater would with her students. Instead the instructor worked to establish the basics of the warm up that included the necessary ideas of physical awareness, relaxation, freeing process, and breathing awareness to allow for the students to study and practice independently.

As per enrollment in the course THR 2640 Voice and Movement, each student was asked to attend class regularly and participate in the voice training based on the Linklater Voice Training Technique that was held twice a week for 1 hour and 50 minutes for a 16 week semester. These voice classes addressed the principles of the Linklater Voice Training Technique including breathing awareness, feeling of vibrations or sound, and physical awareness of the spine, jaw, tongue, throat and soft palate. Students completed daily warm ups addressing all the areas listed. In addition, students developed the language used in the Linklater Voice Training Technique to describe the physical processes of breathing and sound production. The students also applied these principles to work with text.
No Treatment Control

Participants in the no-treatment control group were enrolled in THR 2200 Perspectives of Theater. In contrast to the objectives presented in the Voice and Movement course, Perspectives on Theatre is a course in which theatre students are exposed to a variety of theatrical styles, develop research skills and investigate career opportunities in theatre and related fields. No direct attention is given to vocal training. While Voice and Movement is a very active course in which the student actors physically work to improve their vocal skills, Perspectives on Theatre is more of a passive course in which the students attend lectures twice a week for 1 hour and 15 minutes and complete research assignments. This course is typically completed early in the theatre degree program at the University of Toledo just as the Voice and Movement course. No student participants were enrolled in both courses at the same time. All students at the time of the study may have also participated in other courses in acting, movement, music and history of theatre as well as theatre productions. These other courses or productions may have had elements of voice training embedded in the course. In these cases, the elements of voice training were not explicit parts of the course, nor were the students aware of the elements of training received. None of the participants reported participating in any other vocal training at the time of this study.

Assessment Protocol

Students enrolled in both courses were required to participate in three voice evaluations at the University of Toledo Speech Language Hearing Clinic as part of their course credit. As a method for choosing participants, the graduate student researcher used
the first voice evaluation at the beginning of the semester as both a tool for screening for participants and baseline measures for those participants who passed the screening process. After consent was obtained, the graduate researcher, while supervised by a certified speech language pathologist, administered a voice evaluation to each student including the Quick Screen for Voice and the Voice Diagnostic Protocol (VDP) (Awan, 2001). In addition, each student completed the Voice Quality of Actors Voice Questionnaire (Walzak, McCabe, Madill & Sheard, 2008), during his or her scheduled course meeting time. This Voice Quality of Actors Voice Questionnaire (see Appendix F) was used to help collect demographic information as well as information regarding the participants’ vocal use and habits.

Participants received the initial evaluation of their voices during the first two weeks of the commencement of their respective theatre course. Each student was seen individually and each evaluation lasted approximately one hour. The evaluation included acoustic measures, aerodynamic measures, and questionnaires. The second round of data collection occurred approximately eight weeks into the semester; all students from both courses received an evaluation using identical measures as the baseline collection excluding the Voice Quality for Actors Voice Questionnaire. These measures were evaluated for a third and final time at the conclusion of the semester, approximately 16 weeks after the initial evaluation. To eliminate researcher bias during data collection, the examiner was blind to which theatre course each student was enrolled.

Each voice examination began with the administration of the Quick Screen for Voice (see Appendix A). The Quick Screen for Voice is a screening tool that is appropriate for individual speakers from preschool through adulthood. The Quick Screen
for Voice involves an examiner’s perceptual judgment of voice characteristics including respiration, phonation, and resonation during conversational speech. Participants’ frequency range and vocal flexibility were also measured in this screening tool. These measures were obtained through vocal tasks that investigated habitual pitch and loudness, maximum phonation time and frequency range (Gottliebson, Lee, Weinrich & Sanders, 2007). The administration of the Quick Screen for Voice was video recorded and presented to two certified speech language pathologists for review. Each participant was required to pass the screening as determined by consensus of two certified speech language pathologists to be considered to have a voice that fell within normal limits.

The Functional Indicators of Voice Disorders (see Appendix B) was also administered as part of the Quick Screen for Voice. The Functional Indicators of Voice Disorders is an informal, self-report checklist that helps to identify an individual’s voice differences or habits that may indicate a potential voice disorder (Lee et al., 2004). This checklist aided in identifying the vocal hygiene, habits and behaviors of each acting student.

Upon the completion of the Quick Screen for Voice, each acting student was administered The Voice Diagnostic Protocol (Awan, 2001). The complete Voice Diagnostic Protocol required each acting student to complete multiple tasks including: continuous speech, total phonation range, sustained vowel /a/, intensity evaluation, vital capacity, maximum phonation time (MPT), maximum /s/ duration, and maximum /z/ duration (see Appendix C). The Visipitch IV Real Time Pitch and Multidimensional Voice Program (Kay Pentax) were used to collect acoustic data during tasks assessing F₀ in continuous speech and sustained vowel /a/, and total phonation range tasks. Each of
these measures was audio recorded into the Visipitch IV with a hand held microphone approximately two inches from the each participant’s mouth. Other instrumentation used to complete the *Voice Diagnostic Protocol* included a sound pressure level meter to measure intensity and a spirometer to measure vital capacity.

From these tasks, data was obtained for a variety of acoustic and aerodynamic variables. Acoustic variables measured included: fundamental frequency ($F_0$) while reading, mean speaking intensity, frequency range, $F_0$ of sustained vowel /a/, maximum frequency and minimum frequency, jitter, shimmer, and noise to harmonic ratio (NHR). Aerodynamic variables measured included: vital capacity, MPT, and s/z ratio (see Appendix C for definitions of these terms as used in this study). All of these measures are consistent with measures used in previous investigations to evaluate outcomes of voice training for actors and students of acting (Timmermans et al., 2004; Timmermans et al., 2005, Feudo et al., 1992; Walzak et al., 2008).

The participants also were asked to complete a vocal task that required high-quiet singing. This task examined the students’ ability to sing the first two phrases of the song “Happy Birthday” as quietly as possible at a high pitch. Any lesion of the vocal folds or impairment in vocal fold vibration would be expected to affect the students’ ability to complete the task (Tomblin, Morris, & Spriestersbach, 1994). This procedure and the evaluation protocol were described in a study completed by Bastian, Keidar and Verdolini-Marston (1990), who found this task to be a reliable and valid screening measure. The students’ samples of the song were evaluated perceptually on their voice onset time and continuousness of phonation. Intensity measures were also collected. These three measures were then rated based on a 1-10 rating scale (Bastian, Keidar &
Verdolini-Marston, 1990). The task was video recorded and presented to the same two speech language pathologists that reviewed the *Quick Screen for Voice*. Both speech pathologists and the graduate researcher met to discuss the criteria for which this task was to be judged and practiced evaluating the task using different “Happy Birthday” samples. Once all the judges reached a high level of agreement on the practice tasks, each judge then evaluated each participant’s performances independently of the other judges. Average ratings of the three judges’ scores were taken as the participants’ score for this task.

**Treatment Fidelity**

Treatment fidelity refers to the degree to which administration of a treatment corresponds to the treatment model or protocol (Lek & Justice, 2010). The instructor of the Voice and Movement course was knowingly observed by a colleague who was also familiar with the Linklater Voice Training Technique to determine whether or not the instructor adhered to the principles of Linklater Voice as appropriate for the university course. These observations occurred on two occasions during the sixteen week semester. The first occurred during the eighth week of the semester. The second occurred the sixteenth week of the semester. The instructor created lesson plans for the warm up portion of two regular class meetings and gave these to the graduate researcher. From these lesson plans, the researcher created Treatment Fidelity Checklists (see Appendix D and E) to be completed by both the instructor and the observer.

The observer attended the warm up portion of a class meeting and observed the instructor with the predetermined checklist in hand. As the warm up took place, the
observer checked off the items on the checklist as he saw them completed. If the observer did not see a particular item covered during the session, then that item did not receive a check mark. The observer was also asked to make notes or comments about anything observed during the warm up not listed on the checklist. The instructor was also asked to evaluate herself upon the completion of this warm up using the same treatment fidelity checklist. The instructor and observer did not discuss the observed session and returned their checklists to the researcher separately.

Data Analysis

Treatment fidelity was determined as a percentage of items from the Treatment Fidelity Checklists that both the instructor and observer agreed were completed during the warm up. Regarding the dependent measures of the study, means and standard deviations were determined for the participants in the experimental and control groups for the initial and final assessments measures. Paired dependent t tests were used to compare the means for each group on the following measures from the initial and final assessments: mean speaking fundamental frequency, mean intensity, frequency range, minimum frequency, maximum frequency, jitter (for sustained vowel), shimmer (for sustained vowel), NHR (for sustained vowel), vital capacity, MPT, phonation quotient (PQ), sustained /s/, sustained /z/, s/z ratio, mean “Happy Birthday” ratings and number of items identified in the Functional Indicators of Voice checklist. The data were analyzed using the statistical software Statistical Package for the Social Sciences (SPSS) Version 19. A p Value of 0.05 determined statistically significant findings for this study.
To further analyze any significant changes that were identified in this analysis, paired dependent $t$ tests were used to compare the data taken at the beginning of the semester with data at the midterm (8 week point), and data taken at midterm with data taken at the end of the semester (16 week point). Such analyses may provide further insight into the timing of any changes that are noted.
Chapter Three

Results

Tables 1 and 2 present data for frequency and intensity variables in tasks across time for the experimental group and control groups, respectively.

Table 1

*Frequency and Intensity Variables for the Experimental Group*

<table>
<thead>
<tr>
<th>Task</th>
<th>Initial Assessment</th>
<th>Final Assessment</th>
<th>Difference Over Time</th>
<th>Difference Over Time</th>
<th>$t$ Test</th>
<th>$p$ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Mean</td>
<td>Mean</td>
<td>SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speaking Fundamental Frequency (Hz)</td>
<td>117.69</td>
<td>119.18</td>
<td>1.49</td>
<td>12.41</td>
<td>0.826</td>
<td></td>
</tr>
<tr>
<td>Frequency of sustained vowel /a/ (Hz)</td>
<td>105.91</td>
<td>124.78</td>
<td>18.87</td>
<td>26.86</td>
<td>0.255</td>
<td></td>
</tr>
<tr>
<td>Speaking Intensity (dB)</td>
<td>69.35</td>
<td>70.88</td>
<td>1.53</td>
<td>2.05</td>
<td>0.209</td>
<td></td>
</tr>
<tr>
<td>Frequency Range (Hz)</td>
<td>605.65</td>
<td>638.50</td>
<td>32.85</td>
<td>128.23</td>
<td>0.644</td>
<td></td>
</tr>
<tr>
<td>Minimum Frequency (Hz)</td>
<td>81.88</td>
<td>79.16</td>
<td>-2.72</td>
<td>13.39</td>
<td>0.712</td>
<td></td>
</tr>
<tr>
<td>Maximum Frequency (Hz)</td>
<td>687.51</td>
<td>717.67</td>
<td>30.16</td>
<td>118.45</td>
<td>0.646</td>
<td></td>
</tr>
<tr>
<td>Semitone Range</td>
<td>37.00</td>
<td>38.50</td>
<td>1.50</td>
<td>5.80</td>
<td>0.641</td>
<td></td>
</tr>
</tbody>
</table>
Table 2

*Frequency and Intensity Variables for the Control Group*

<table>
<thead>
<tr>
<th>Task</th>
<th>Initial Assessment</th>
<th>Final Assessment</th>
<th>Difference Over Time</th>
<th>Difference Over Time</th>
<th>t Test</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Mean</td>
<td>Mean</td>
<td>SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speaking Fundamental Frequency (Hz)</td>
<td>112.24</td>
<td>120.28</td>
<td>8.04</td>
<td>1.52</td>
<td>0.002*</td>
<td></td>
</tr>
<tr>
<td>Frequency of sustained vowel /a/ (Hz)</td>
<td>108.54</td>
<td>124.28</td>
<td>15.74</td>
<td>29.50</td>
<td>0.246</td>
<td></td>
</tr>
<tr>
<td>Frequency Range (Hz)</td>
<td>551.18</td>
<td>445.33</td>
<td>-105.85</td>
<td>104.22</td>
<td>0.135</td>
<td></td>
</tr>
<tr>
<td>Minimum Frequency (Hz)</td>
<td>73.59</td>
<td>78.48</td>
<td>4.89</td>
<td>7.96</td>
<td>0.308</td>
<td></td>
</tr>
<tr>
<td>Maximum Frequency (Hz)</td>
<td>624.77</td>
<td>538.81</td>
<td>-85.96</td>
<td>130.89</td>
<td>0.280</td>
<td></td>
</tr>
<tr>
<td>Semitone Range</td>
<td>36.75</td>
<td>33.50</td>
<td>-3.25</td>
<td>3.37</td>
<td>0.279</td>
<td></td>
</tr>
</tbody>
</table>

*t Test results were considered statistically significant if p < 0.05

There was no significant difference for any of the measures of frequency or intensity for the experimental group over 16 weeks of training. The mean speaking fundamental frequency for the control group was significantly higher after 16 weeks without training.

Tables 3 and 4 present data for perturbation variables in tasks across time for the experimental and control groups, respectively.
Table 3

**Perturbation Variables for Experimental Group**

<table>
<thead>
<tr>
<th>Task</th>
<th>Initial Assessment</th>
<th>Final Assessment</th>
<th>Difference Over Time</th>
<th>Difference Over Time</th>
<th>t Test</th>
<th>Mean</th>
<th>Mean</th>
<th>Mean</th>
<th>SD</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jitter (%)</td>
<td>0.60</td>
<td>0.47</td>
<td>-0.13</td>
<td>0.19</td>
<td>0.256</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shimmer (%)</td>
<td>3.94</td>
<td>4.29</td>
<td>0.35</td>
<td>2.81</td>
<td>0.819</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NHR (dB)</td>
<td>0.17</td>
<td>0.16</td>
<td>-0.01</td>
<td>0.09</td>
<td>0.858</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4

**Perturbation Variables for Control Group**

<table>
<thead>
<tr>
<th>Task</th>
<th>Initial Assessment</th>
<th>Final Assessment</th>
<th>Difference Over Time</th>
<th>Difference Over Time</th>
<th>t Test</th>
<th>Mean</th>
<th>Mean</th>
<th>Mean</th>
<th>SD</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jitter (%)</td>
<td>0.69</td>
<td>0.36</td>
<td>-0.33</td>
<td>0.42</td>
<td>0.216</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shimmer (%)</td>
<td>3.96</td>
<td>2.55</td>
<td>-1.41</td>
<td>0.82</td>
<td>0.042*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NHR (dB)</td>
<td>0.14</td>
<td>0.12</td>
<td>-0.02</td>
<td>0.01</td>
<td>0.085</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* t Test results were considered statistically significant if p < 0.05

There was no significant difference for any of the perturbation measures for the experimental group over 16 weeks. In the control group, the shimmer variable was significantly lower after 16 weeks without training.

Tables 5 and 6 present data for aerodynamic variables in tasks across time for the experimental and control groups, respectively.
### Table 5

**Aerodynamic Variables for Experimental Group**

<table>
<thead>
<tr>
<th>Task</th>
<th>Initial Assessment</th>
<th>Final Assessment</th>
<th>Difference Over Time</th>
<th>Difference Over Time</th>
<th>t Test</th>
<th>Mean</th>
<th>Mean</th>
<th>SD</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vital Capacity (mL)</td>
<td>4714.17</td>
<td>4492.50</td>
<td>-221.67</td>
<td>449.18</td>
<td>0.396</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MPT (s)</td>
<td>25.01</td>
<td>31.66</td>
<td>6.65</td>
<td>2.69</td>
<td>0.016*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phonation Quotient (mL/s)</td>
<td>190.14</td>
<td>141.52</td>
<td>-48.62</td>
<td>28.83</td>
<td>0.043*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sustained /s/ (s)</td>
<td>37.62</td>
<td>42.62</td>
<td>5.00</td>
<td>10.62</td>
<td>0.415</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sustained /z/ (s)</td>
<td>37.42</td>
<td>38.52</td>
<td>1.10</td>
<td>8.00</td>
<td>0.802</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>s/z Ratio</td>
<td>1.04</td>
<td>1.09</td>
<td>0.05</td>
<td>0.31</td>
<td>0.777</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*t Test results were considered statistically significant if p < 0.05

### Table 6

**Aerodynamic Variables for Control Group**

<table>
<thead>
<tr>
<th>Task</th>
<th>Initial Assessment</th>
<th>Final Assessment</th>
<th>Difference Over Time</th>
<th>Difference Over Time</th>
<th>t Test</th>
<th>Mean</th>
<th>Mean</th>
<th>SD</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vital Capacity (mL)</td>
<td>4730.84</td>
<td>5074.17</td>
<td>343.33</td>
<td>370.34</td>
<td>0.161</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MPT (s)</td>
<td>19.49</td>
<td>22.99</td>
<td>3.50</td>
<td>6.55</td>
<td>0.363</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phonation Quotient (mL/s)</td>
<td>251.49</td>
<td>246.01</td>
<td>-5.48</td>
<td>57.55</td>
<td>0.861</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sustained /s/ (s)</td>
<td>25.12</td>
<td>25.39</td>
<td>0.27</td>
<td>0.86</td>
<td>0.577</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sustained /z/ (s)</td>
<td>29.18</td>
<td>25.67</td>
<td>-3.51</td>
<td>5.32</td>
<td>0.279</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>s/z Ratio</td>
<td>0.94</td>
<td>1.03</td>
<td>0.09</td>
<td>0.19</td>
<td>0.388</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In the experimental group the MPT was significantly higher after 16 weeks of training. The phonation quotient (PQ) was significantly lower after 16 weeks of training. This decrease in the PQ would be expected as the PQ is a ratio of MPT to vital capacity. Therefore, as the MPT increases the PQ should decrease as long as vital capacity remains relatively similar between assessments as seen in Table 5. There was no significant difference in the control group for aerodynamic measures over 16 weeks.

Table 7 presents data for the high, quiet singing of *Happy Birthday* for both the experimental and control groups over 16 weeks. This table presents the mean ratings of singing trials for participants in each group based on the 1-10 rating scale developed by Bastian et al. (1990).

<table>
<thead>
<tr>
<th>Group</th>
<th>Initial Assessment</th>
<th>Final Assessment</th>
<th>Difference Over Time</th>
<th>Difference Over Time</th>
<th>t Test</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Group</td>
<td>8.47</td>
<td>8.25</td>
<td>-0.22</td>
<td>1.56</td>
<td>0.794</td>
<td></td>
</tr>
<tr>
<td>Control Group</td>
<td>8.53</td>
<td>9.08</td>
<td>0.55</td>
<td>0.54</td>
<td>0.129</td>
<td></td>
</tr>
</tbody>
</table>

There was no significant difference for this task for either group over 16 weeks.
Table 8 presents data for the items checked on the *Functional Indicators of Voice Disorders* for both the experimental and control groups over 16 weeks.

Table 8

*Functional Indicators of Voice Disorders from Quick Screen for Voice Variables for Experimental and Control Groups*

<table>
<thead>
<tr>
<th>Group</th>
<th>Initial Assessment</th>
<th>Final Assessment</th>
<th>Difference Over Time</th>
<th>Difference Over Time</th>
<th>t Test</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Group</td>
<td>12.00</td>
<td>11.75</td>
<td>-0.25</td>
<td>2.87</td>
<td>0.873</td>
<td></td>
</tr>
<tr>
<td>Control Group</td>
<td>6.75</td>
<td>5.50</td>
<td>-1.25</td>
<td>2.22</td>
<td>0.342</td>
<td></td>
</tr>
</tbody>
</table>

There was no significant difference in the mean number of functional indicators reported for either group over 16 weeks. Similar trends were exhibited in students’ responses on the *Voice Quality of Actors Voice Questionnaire* (Walzak et al., 2008). On the questionnaire, the experimental group reported experiencing an average of 8 negative voice symptoms at the time of initial assessment. The control group reported experiencing an average of 4 of the same negative voice symptoms reported by the experimental group. This is approximately half as many as reported by the experimental group. These findings are similar to those noted for participants’ responses on the functional indicators checklist. Likewise, the average number of voice symptoms reported at the final assessment was only slightly lower (experimental=7, control=3) than the initial assessment. This trend of experiencing nearly the same number of voice symptoms was also seen in the *Functional Indicators Checklist*. 
The Voice Quality of Actors Voice Questionnaire also revealed that the two groups in the study were rather similar in their voice use, habits and behaviors at the initial assessment. The experimental group did have a higher average alcohol use than that of the control group (experimental=32 drinks per month, control=7 drinks per month); however, this difference between groups is not significant \((p =0.443)\) and one subject reported a much higher number of drinks per month than the others. At the final assessment the majority of each groups’ reported vocal behaviors remained the same. In the final assessment however, the experimental group reported a slightly higher amount of average voice use each day (3 hours a day at initial assessment to 3.75 hours a day at final assessment) and the control group reported slightly less voice use each day (5 hours a day at initial assessment to 4.25 hours a day at final assessment). Also, the average number of alcoholic drinks consumed each month decreased in the experimental group (initial assessment=32, final assessment=12) as the one subject reported less alcohol use.

Table 9 presents a comparison of initial, mid-training and final assessment variables that showed significance in the experimental group.

<table>
<thead>
<tr>
<th>Task</th>
<th>Initial Assessment</th>
<th>Mid-Training Assessment</th>
<th>Final Assessment</th>
<th>Difference Over Time (Initial-Mid)</th>
<th>Difference Over Time (Mid-Final)</th>
<th>(t) Test (Initial-Mid)</th>
<th>(t) Test (Mid-Final)</th>
<th>(p) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPT (s)</td>
<td>Mean 25.01</td>
<td>Mean 25.69</td>
<td>Mean 31.66</td>
<td>Mean 0.68</td>
<td>Mean 5.97</td>
<td>Mean 0.678</td>
<td>Mean 0.020*</td>
<td></td>
</tr>
<tr>
<td>Phonation Quotient</td>
<td>190.14</td>
<td>167.69</td>
<td>141.52</td>
<td>-22.45</td>
<td>-26.17</td>
<td>0.139</td>
<td>0.192</td>
<td></td>
</tr>
</tbody>
</table>

\(*t\) Test results were considered statistically significant if \(p < 0.05\)
For the MPT there was no significant change from the beginning of the training to after 8 weeks of training; however there was a significant increase in MPT from mid-training assessment (8 weeks) to the final assessment (16 weeks). While Table 5 above showed a significant difference in the PQ from the beginning of the course to the end of the 16 week training, no significant difference for measures of PQ was present between the beginning of the course to after 8 weeks of training, nor between after 8 weeks of training and the end of the 16 week training period as displayed in Table 9. Therefore the PQ showed a gradual significant change from the initial assessment to the final assessment.

Table 10 presents a comparison of initial, mid-training and final assessment variables that showed significance in the control group.

Table 10

*Comparison of Initial, Mid-Training, and Final Data for Frequency and Shimmer Variables in the Control Group*

<table>
<thead>
<tr>
<th>Task</th>
<th>Initial Assessment</th>
<th>Mid-Training Assessment</th>
<th>Final Assessment</th>
<th>Difference Over Time (Initial-Mid)</th>
<th>Difference Over Time (Mid-Final)</th>
<th>t Test (Initial-Mid)</th>
<th>t Test (Mid-Final)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speaking Fundamental Frequency (Hz)</td>
<td>Mean</td>
<td>Mean</td>
<td>Mean</td>
<td>Mean</td>
<td>Mean</td>
<td>p value</td>
<td>p value</td>
</tr>
<tr>
<td></td>
<td>112.24</td>
<td>114.99</td>
<td>120.28</td>
<td>2.75</td>
<td>5.29</td>
<td>0.092</td>
<td>0.018*</td>
</tr>
<tr>
<td>Shimmer (%)</td>
<td>3.96</td>
<td>4.15</td>
<td>2.55</td>
<td>0.19</td>
<td>-1.60</td>
<td>0.829</td>
<td>0.085</td>
</tr>
</tbody>
</table>

*t Test results were considered statistically significant if p < 0.05

There was no significant difference for measures of mean speaking fundamental frequency (F₀) from the beginning of the semester to the mid-training point; however there was a significant increase in speaking F₀ from the midterm evaluation to the end of the 16 week semester. While Table 4 above showed a significant decrease in the
measures of shimmer from the beginning of the semester to the end of the 16 week semester, no significant difference for measures of shimmer was found between the beginning of the course to after an 8 week period, nor between after a 8 week period and the end of the 16 week semester. There was an increase in mean shimmer between the initial assessment and midterm assessment; however this increased shimmer value still falls within normal limits at less than five percent. As these students were not receiving direct voice training in their courses, this increase in shimmer could be due to general shimmer variance between participants and tasks. This shimmer value then decreases between the midterm assessment and the final assessment. Again neither of these changes was significant, nor did they present above the normal range for shimmer.

**Reliability of Happy Birthday Task**

After each voice evaluation, the graduate researcher, along with two speech language pathologists, rated each participant’s high-quiet singing of the song *Happy Birthday* on a 1-10 ordinal scale developed by researchers Bastian, Keider, and Verdolini-Marston (1990). These authors provided severity ranges based on this ordinal scale. Based on their research, participants with scores of 1-4 on the task presented with some impairment of the vocal fold membrane. Participants with scores of 5-7 varied, with some presenting laryngeal findings, such as lesions, if further observed with videostroboscopy and others not showing any. Participants with scores of 8-10 on the scale were determined to have no abnormal laryngeal findings based on the judges’ perception (Tomblin, Morris & Spriestersbach, 1994). Based on these three severity range categories, interjudge reliability was calculated by determining the three judges’
agreement as to which category each participant fell for each trial of participants’ singing.

In the initial *Happy Birthday* evaluation at the start of the semester, there was an interjudge reliability rating of 97%. The mid-training evaluation revealed a 96% interjudge reliability rating. Likewise, at the evaluation completed at the end of the treatment period, an interjudge reliability rating of 96% was observed. This shows that the judges were in good agreement while determining each participant’s proficiency of the high-quiet singing of *Happy Birthday*.

**Treatment Fidelity**

The graduate researcher compared the instructor’s and observer’s responses on the returned Treatment Fidelity Checklists to determine how faithfully the instructor followed her predetermined lesson plan on two separate occasions over the training period. Additional comments and notes were included in this comparison. On the initial Treatment Fidelity Checklist, there was 81% agreement between the instructor and the observer ratings. Likewise, the instructor and observer shared similar comments regarding the observed session. On the second Treatment Fidelity Checklist there was 93% agreement between the observer and instructor ratings. These high agreement levels show good treatment fidelity, indicating the instructor generally adhered to her instructional protocol based on the Linklater Voice Training Technique.
Chapter Four

Discussion and Conclusions

The aim of this study was to determine if student actors with normal voices who participated in a vocal training course, based on the Linklater Voice Training Technique, experienced significant changes in their voices when measured perceptually, acoustically and aerodynamically compared to other student actors who did not receive training in Linklater Voice. Results of paired t test analyses indicated a significant increase in maximum phonation time ($p = 0.016$) and a significant decrease in mean phonation quotient ($p = 0.043$) for the experimental group. A significant increase in mean fundamental frequency ($p = 0.002$) in connected speech and a significant decrease in mean shimmer ($p = 0.042$) during production of the vowel /a/ were found for the control group.

The observed increase in maximum phonation time and decrease in phonation quotient for participants in Linklater Voice training are consistent with findings of other studies of student actors who received vocal training. Feudo et al. (1992) identified increased maximum phonation time in their participants and interpreted their results as an indication of increased respiratory control and phonatory endurance. The student actors in this study were able to demonstrate more efficient airflow during a sustained vowel task. Such increased respiratory control and phonatory endurance could be useful for an actor who requires efficient airflow for multiple on stage tasks.

While Feudo et al. (1992) suggest that increased MPT may be the result of participants’ improved control of airflow during sustained phonation, Kristen Linklater writes that in the Linklater Voice Training Technique acting students must develop the
ability to observe the complexities of the breathing mechanism without controlling them, or in other words, without creating physical tension that impedes the natural process. Linklater writes that her vocal training method works to teach student actors to remove habitual muscle tension over the breathing mechanism and accessory muscles to allow the involuntary processes of breathing to take over in moments of truthful character expression (Linklater, 2006). This involuntary process of breathing refers to the normal physiology of the respiratory system for producing voice and speech. In other words, the Linklater Voice Training Technique allows student actors to learn to control their breathing by allowing for self-discovery of the natural breathing process and eliminating any physical tension that inhibits the natural physiology of voice production.

Normal respiratory function requires the active contraction of the diaphragm and muscles of inspiration followed by passive expiration as the forces of torque, elasticity and gravity naturally restore the system to its resting position. For voice and speech production, the respiratory system must be altered through active expiration to capitalize on expiration time to maintain subglottic pressure and vocal fold vibration (Seikel, King, & Drumright, 2005). While Kristen Linklater acknowledges this natural process for voice production, she does not use the typical anatomical or physiological nomenclature in her description of the breathing process for fear of students developing a forced voice production. The Linklater Voice Training Technique, nonetheless, allows students to develop awareness of these processes through metaphor and analogy while eliminating physical tension that may inhibit this natural breathing process (Linklater, 2006). It is a hope of the Linklater Voice Training Technique that the natural breathing process without physical tension, which is discovered during training, can be translated into a free
and natural voice on stage where an actor faces increased demands on the voice when compared to simple vowel production.

As previously discussed, Feudo et al. (1992) interpreted their results of increased MPT as an indication of increased respiratory control and phonatory endurance. These authors suggest that this increased respiratory efficiency could be useful for an actor who requires control of airflow for multiple on stage tasks. Not only must an actor project his or her voice audibly enough to the audience during lengthy monologues or dialogues, he or she often must also do so while moving and emoting in physically demanding ways. Depending on the text and direction, actors may need to cry, shout, use an accent, fight or maintain suboptimal body postures while delivering lines on stage. Again, Kristen Linklater states that her vocal training method works to eliminate any physical tension to allow for moments of truthful character expression on the stage (Linklater, 2006). Results of the present study suggest that those who participated in the Linklater Voice Training Technique were better able to maintain efficient airflow during the maximum sustained vowel phonation task. While there may be some relationship between sustained phonation and on stage tasks, the relationship is currently unclear based on existing research and the limitations of this preliminary study.

In the present study, student actors received Linklater Voice training over a relatively brief period (16 weeks). In previous studies, students typically had more time to gain mastery of the principles in the vocal training programs presented. When comparing initial, mid-training, and final data for aerodynamic variables in the experimental group, results revealed that the significant increase in MPT occurred in the last 8 weeks of the semester. Therefore, in this study student actors needed all 16 weeks
of training to have a significant increase in MPT. Nevertheless, participants in the Linklater Voice Training Technique were able to achieve results with MPT that were consistent with those of participants in the previous studies even after a relatively brief training period.

The control group in this study also experienced significant changes in their voices without training. Mean speaking fundamental frequency for this group increased from 112 Hz to 120 Hz. Although statistically significant, such a change appears to be of limited practical significance. Both the initial and final assessment values are within the typical frequency range as suggested by Awan (2001) for males of this age (100 to 150 Hz). In addition, the mean speaking F₀ is known to vary widely both within individuals and across speaking tasks. The change in this study simply brought the control group’s mean F₀ (approximately 112 Hz at the initial assessment to 120 Hz at the final assessment) closer to the mean F₀ of the experimental group (approximately 117 Hz at initial assessment to 119 at final assessment).

The control group also experienced a significant decrease in shimmer values, from 3.96 dB at the initial assessment to 2.55 dB at the final assessment. The experimental group, on the other hand, experienced an increase in shimmer, going from 3.94 dB at initial assessment to 4.29 dB at the final assessment. While this increase in shimmer for the experimental group was not significant and both the initial and final shimmer values of this group fell within the normal range for shimmer, these findings do somewhat parallel those reported in another recent study by Walzak et al. (2008) which also examined the effect of vocal training on the voices of student actors. Walzak et al. found increased shimmer values for participants in their study, which they suggested may
indicate that participants had not mastered the skill of producing a loud voice without increased effort (Walzak et al., 2008). The increased shimmer of participants receiving training in the present study, especially in light of the significant decrease in shimmer for those who did not, may be reflecting a similar phenomenon in the Linklater training. This trend for increased shimmer in those receiving training suggests the need for careful monitoring of this variable during training.

Walzak et al. (2008) also suspect that the increase in shimmer observed in their study’s participants could be attributed to abusive vocal behaviors often exhibited by actors (Walzak et al., 2008). Timmermans et al. (2005) determined that while the future professional voice users who participated in their study were aware of their dependency on their voices, many forgot to take precautions for adequate voice care. In this study, a questionnaire regarding the poor vocal habits of smoking, stress, vocal abuse and eating late meals showed that the number of students who reported these activities either stayed the same or increased from the study’s onset to the end of the 18 month vocal training period which included vocal hygiene education (Timmermans et al., 2005). This shows that even with vocal hygiene education these future professional voice users did not modify their vocal habits which may have contributed to the increased shimmer values as seen by Walzak et al. (2008).

In the present study, a similar trend was seen in the persistence of poor vocal habits and behaviors among the student actor participants. Student reports from the *Voice Quality of Actors Voice Questionnaire* and the *Functional Indicators of Voice Disorders* from the *Quick Screen for Voice* showed little change in the vocal health, habits and behaviors for both the experimental and control groups. Additionally, the student actors
in the experimental group indicated more poor vocal behaviors than those in the control
group at both the initial and final assessments which may contribute to this groups’
increase in shimmer values.

While negative effects of training were not observed in this study, the trend for
shimmer to increase in Linklater Voice participants and to decrease significantly in those
not receiving training suggests the need for careful monitoring of this variable during
training. When instructed properly, the Linklater Voice Training Technique was shown to
have beneficial effects on the voices of student actors even after a relatively brief period
of training.

While some significant findings in the present study are consistent with prior
research, previous studies have reported significant changes in other variables not seen in
this study. For example, while Feudo et al. (1992) determined a significant increase in
MPT consistent with the present study, they also saw a significant increase in frequency
range after training. Likewise, Walzak et al. (2008) found that participants experienced a
significant increase in frequency range after their 12 month voice training period. In the
present study, student actors who received Linklater Voice training did have an increased
average frequency range; however, this change was not significant. The Linklater Voice
Training Technique does include exercises that require students to use the voice at
several different frequencies to increase the variety of sound and encourage vocal
flexibility (Linklater, 2006); however the student actors who participated in the present
study may require more time to achieve the significant changes in frequency range that
were found in the participants of the Feuedo et al. (1992) and Walzak et al. (2008)
studies. The participants in these previous studies received voice training for 9-12
months, whereas the participants in the present study received training for 16 weeks which indicates that further investigation into the Linklater Voice Training Technique over a longer period of time is warranted to more fully assess the efficacy of the Linklater Voice Training Technique.

Studies completed by Timmermans et al. (2004; 2005) reported significant positive changes in scores on the Dysphonia Severity Index (DSI) and the Voice Handicap Index (VHI) in student actors who received voice training for 9-18 months. These measures were not used in the present study and further investigation into the Linklater Voice Training Technique would benefit from including additional evaluation measures such as these. Beyond acoustic and aerodynamic measures, other perceptual measures such as participants’ self-report, instructor report, and a functional evaluation of on stage acting tasks would also be useful to more fully assess the practical effects of Linklater Voice training for student actors. In this study, some self-report information was obtained regarding participants’ perception of their own voices; however, more items allowing participants to share their notions of the effect of the training would strengthen the research in this area.

In addition to other outcome measures and a more lengthy time period for training, future investigations into the effects of the Linklater Voice Training Technique should include a larger number of student actors. The number of participants chosen for the present study is regrettably small due to the small number of students enrolled in the participating theatre courses, especially in THR 2640 Voice and Movement. Additionally, several potential participants enrolled in the theatre courses did not pass the screening protocol to be chosen for the study. Further randomized controlled
investigations that include a greater number of participants, a lengthier training period, and other outcome measures, especially a variety of perceptual measures, would aid in assessing the effects of the Linklater Voice Training Technique in the voices of student actors.

In addition, further investigations into the characteristics of the voices of student actors pre and post Linklater Voice warm up would be beneficial in understanding the effects of the Linklater Voice Training Technique. The warm up exercises in the Linklater Voice Training Technique are an essential piece of the training and a student studying Linklater Voice is urged to complete the warm up on a regular basis, especially before completing voice tasks such as those used in the present study. Kristen Linklater writes that the student actors are working to recondition their communication not just the voice, therefore committed work on the warm up and continued practice of the exercises presented in the course are strongly encouraged (Linklater, 2006). In the present study, data was not collected as to whether or not the students who studied the Linklater Voice Training Technique had completed the warm up exercises immediately prior to the voice assessments. Therefore, it is not clear if warm up prior to the data collection would have influenced the results of this study such as to increase the significant difference between the experimental and control group. Further study into the effect of the warm up developed in the Linklater Voice Training Technique is warranted to truly examine the effects of Linklater Voice.

Results of the Quick Screen for Voice in this study indicated that many student actors may experience some voice abnormalities that require further investigation. Eleven out of 24 student actors in this study (46%) did not demonstrate voices that were within
normal limits as determined by two certified speech language pathologists. Of these 11 students who did not pass the screening upon the initial assessment, one male completed the Linklater Voice Training Technique and did show improvement in the areas of frequency range (37 semitones to 43 semitones) and reduced perturbation measures (jitter values 0.473 to 0.248) in the final assessment. His MPT slightly decreased from the initial assessment (29.37 seconds) to the final assessment (26.96 seconds). While this measure decreased for this single subject, his MPT fell within normal limits. These changes of increased phonation range and decreased perturbation measures presented by this subject, while not similar to the findings seen in the experimental group, do show correlation to exercises presented in the Linklater Voice Training Technique.

The small number of participants eligible for the present study suggests that additional research into the incidence and prevalence of voice problems in the student actor population is warranted. Untrained actors may develop poor vocal habits that can result in vocal abuse. The actor’s voice and vocal health are of particular interest to speech language pathologists due to the fact that actors often face many special circumstances that make them susceptible to voice difficulties that can result in vocal damage or pathologies. Knowledge of an actor’s vocal training method, or lack thereof, can aid in determining the cause of any vocal dysfunction. Likewise, knowledge of the basic principles included in most vocal training approaches and of the methods of local voice-training professionals can help to create an interdisciplinary approach to achieving and maintaining optimal vocal health for actors (Benninger, Jacobson, Johnson, 1994).

Further investigations of the effects of the Linklater Voice Training Technique on student actors with abnormal voices may be beneficial to aid future professional voice
users in determining an appropriate vocal training approach to improve their vocal performance. Likewise, further investigation into the principles of the Linklater Voice Training Technique and its effects on the abnormal voice may interest speech language pathologists when determining appropriate therapeutic techniques for other individuals with vocal pathologies.

In conclusion, the present study demonstrates that the Linklater Voice Training Technique positively impacts aspects of voice production of student actors while posing little apparent risk or harm to their voices. The ability to phonate for a long period of time requires efficient control of both the breathing and laryngeal muscles and efficient coordination between these two systems. The Linklater Voice Training Technique therefore, targets efficient use of both these systems by releasing forces that might be antagonistic to voicing through the imagery of “freeing the voice.” The metaphorical terms used in this technique have the effect of releasing tension and thus antagonistic forces. If this technique has such effect in preparing the voice for the stage, its possible implications for speech therapy on pathological voices would be worthy of investigation. Further studies also into the efficacy of the Linklater Voice Training Technique are warranted and should include a larger sample of student actors and a longer period of study of the Linklater Voice Training Technique. The effects of the Linklater Voice Training Technique on voices that do not fall within the normal range and the effects of the warm up immediately prior to voice assessment should be examined. This preliminary study shows that the study of the Linklater Voice Training Technique was beneficial for the student actors who participated in the training.
References


Pathology, 19(4), 369-379.


Appendix A

Quick Screen for Voice
(Lee, Stemple, Glaze & Kelchner, 2004)

Name: __________________________________________________________________________________

Birth Date: ______________________ Screening Date: ______________________ Age: ______

Speech-Language Screening Date: ______________________ Passed Failed

If failed, describe communication status: ____________________________________________________

Hearing Screening Date: ______________________ Passed Failed

If failed, describe hearing status: ______________________________________________________________

Pertinent medical and social history: __________________________________________________________

_____________________________________________________________________________________

Directions: The Quick Screen for Voice should be conducted in a quiet area. Elicit verbal activities, such as spontaneous conversation, picture description, imitated sentences, recited passages, counting, and other natural samples of voice and speech, or perform the tasks requested. The screening test is failed if one or more disorders in production are found in any area, indicating that a more thorough evaluation is needed.

Mark all observations that apply, as the individual produces connected speech:

Respiration

_____ Inhalatory stridor or expiratory wheeze

_____ Infrequent breaths; talking too long on one breath

_____ Normal respiration for speech

_____ Limited breath support for speech

Phonation

_____ Rough or hoarse quality

_____ Vocal strain and effort

_____ Conversational pitch is too high or too low

_____ Conversational voice is too loud or too soft

_____ Conversational voice is limited in pitch or loudness variability

_____ Normal voice quality

_____ Breathy quality

_____ Aphonia

_____ Hard glottal attacks

_____ Persistent glottal fry

Resonance

_____ Hyponasality (observed during humming, nasal

_____ Hypernasality (observed during vowel and oral consonants)

_____ Juvenile resonance characteristics

_____ Consistent mouth breathing Buy Bobby a puppy, Take a ticket to Daddy, etc.)

_____ Nasal turbulence or audible nasal emission

_____ Normal resonance

43
Nonverbal Vocal Range and Flexibility

Model the series of nonverbal tasks that are described on the test form. Multiple trials are allowed. Visual cues such as hand gestures, moving a toy car across the table (for maximum phonation time) or up and down a hill (for pitch range), etc. may be used to supplement the auditory model.

1. Habitual pitch and loudness task: “Count from 1 to 10. Repeat, but stop at ‘three’ and hold out the /i:/.”

_____ Abnormal pitch and/or loudness

_____ Normal pitch and loudness

2. Maximum phonation time (MPT) task: “Take your biggest breath and hold out an /a:/ as long as possible.” Record time with a secondhand.

_____ Number of seconds /a/ was sustained.

_____ MPT less than:

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Normal Mean in Seconds (Range)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>7 (3–11)</td>
</tr>
<tr>
<td>4</td>
<td>9 (5–15)</td>
</tr>
<tr>
<td>5</td>
<td>10 (5–16)</td>
</tr>
<tr>
<td>6–7</td>
<td>13 (5–20)</td>
</tr>
<tr>
<td>8–9</td>
<td>16 (5–29)</td>
</tr>
<tr>
<td>10–12</td>
<td>20 (9–39) Males</td>
</tr>
<tr>
<td></td>
<td>16 (5–28) Females</td>
</tr>
<tr>
<td>13–17</td>
<td>23 (9–43) Males</td>
</tr>
<tr>
<td></td>
<td>20 (9–34) Females</td>
</tr>
<tr>
<td>18+</td>
<td>28 (9–62) Males</td>
</tr>
<tr>
<td></td>
<td>22 (6–61) Females</td>
</tr>
</tbody>
</table>

Note. MPT values are related to age and height; multiple attempts also influence results.

*Data summarized from Kent, Kent, & Rosenbek (1987)

_____ MPT within normal limits

3. Pitch range task: “Make your voice go from low to high like this (demonstrate upward pitch glide on the word ‘whoop’). Now go down from your highest to low (demonstrate rapid downward pitch glide like a bomb falling).” Or, model and elicit a fire siren sound.

_____ Little pitch variation

_____ Voice breaks in pitch glides up or down

_____ Acceptable pitch range and flexibility

Other Comments or Observations

_____________________________________________________________________________________

_____________________________________________________________________________________

_____________________________________________________________________________________

_____________________________________________________________________________________

_____________________________________________________________________________________

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Appendix B

Functional Indicators of Voice Disorders

Based on Checklist in *Quick Screen for Voice*  
(Lee, Stemple, Glaze & Kelchner, 2003)

Please check all that apply to you:

__ Cough, clear throat or choke frequently
__ Have difficulty breathing or swallowing
__ Complain of a sore throat often
__ Voice sounds rough, hoarse, breathy, weak or strained
__ Lose voice every time you have a cold
__ Always sound “stuffed up,” like during a cold; sound like you’re talking “through the nose”
__ Voice sounds worse at different times of the day
__ Sounds different from your friends of the same age and sex
__ Voice sounds worse after shouting, singing, being outdoors, or talking for a long time
__ Use a lot of effort to talk; or complain about vocal fatigue
__ Yell, scream or cry frequently
__ Likes to sing and perform often; participates in acting and/or singing groups
__ Participates in sports activities or cheerleading activities that require yelling and calling
__ Have difficulty being understood by unfamiliar listener
__ Can’t be heard easily when there is background noise
__ Talk more loudly than others in the family, job, or classroom
__ Voice problem is interfering with performance at work or school
__ Don’t like the sound of your voice; teased by the sound of your voice
__ Attends many loud social events (parties, concerts, sports games)
__ Seem tired or unhappy a lot of the time
__ Facing difficult changes such as death, divorce, financial problems
___ Do not express your feelings to anyone

___ Live with a family that uses loud voices frequently

___ Smoke or are exposed to smoke at home or on the job

___ Use alcohol; if yes please provide frequency: _____________

___ Eat “junk food” frequently; or complain of heartburn or sour taste in the mouth

___ Drink beverages that contain caffeine; drink little water; if yes to caffeine use give frequency:

___ Have allergies, respiratory disease, or frequent upper respiratory infections

___ Have hearing loss or frequent ear infections

___ Take prescription medication (please list)

___ Have a history of injuries to the head, neck, or throat (please describe)

___ Have had surgeries (please describe)

___ Was intubated at birth or later (please describe)

___ Have a chronic illness or disease (please describe)

Your primary concerns about your voice are (please describe):
Appendix C

Explanation of VariablesMeasured
(Awan, 2001)

Mean Speaking Fundamental Frequency (Fo): This is a measure related to the perceptual measure of habitual pitch measured in Hertz (Hz). In this study, Fo in continuous speech was collected through reading of the “Rainbow Passage” in the participants’ normal speaking voice. In normal male participants ages 20-29, the mean speaking frequency is 128 Hz with a range of 119 to 138 Hz.

Minimum to Maximum Phonational Frequency (Fo) Range: Range is a measure from the lowest Fo that can be produced to the highest Fo. For this study, total phonation range was collected through beginning a sustained vowel in modal register and moving up in steps to the highest Fo in falsetto. Then, starting back at that modal register and moving in steps to the lowest Fo possible. Minimum to maximum phonational frequency range can be converted to musical notes to determine a semitone range (see below).

Lowest Fo: Lowest Fo produced during the total phonation range task moving down in steps from a modal register.

Highest Fo: Highest Fo produced during the total phonation range task moving up in steps from a modal register.

Semitone Range: Range may also be reported in terms of musical notes. In this study a semitone ranges was determined by converting the lowest Fo and highest Fo frequencies to musical tones and finding the ranges between these tones. Normal adult voices typically have a frequency range between 24-36 semitones.

Sustained Vowel Mean Fo: Again this measure is related to the habitual frequency of each participant. In this task however, mean Fo was found through participants sustaining the vowel /a/. Again the typical frequency for adult males is between 119-138 Hz.

Jitter: Jitter is a measure of vocal quality as determined by the observing the cycles of the sound waveform produced. This is a measure of the cycle-to-cycle perturbations in a vocal period. In this study, jitter was measured in Jitter (%) RAP, or relative average perturbation, in a sustained vowel task. This is done to remove relatively isolated and/or long-duration fluctuations in cycle-to-cycle perturbation. In normal participants jitter (%) is expected to be <1%.

Shimmer: Shimmer is another measure of vocal quality. Shimmer measures the cycle-to-cycle perturbations in amplitude of sound waveforms. In this study, shimmer was measured in Shimmer (%) RAP, or the average cycle-to-cycle amplitude perturbation divided by the average cycle amplitude in a sustained vowel task. In normal participants shimmer is considered to be 5% or less.
**Noise to Harmonic Ratio (NHR):** NHR is another voice quality measure that looks at the ratio of harmonic to inharmonic (or signal to noise) energy in the voice waveform. In this study, NHR is reported in decibels (dB).

**Mean Speaking Intensity:** Intensity refers to the power of the sound signal and is measured in decibels (dB). Intensity can be described perceptually as the loudness of a signal. Normal mean speaking intensity 30cm distance from the sound level meter microphone for adults is between 65 and 70 dB.

**Vital Capacity:** This measure is the maximum amount of air that can be exhaled after maximum inhalation. For this study vital capacity was measured with a spirometer and reported in milliliters (mL). Adult males are expected to have a vital capacity of 4000 to 5000 mL.

**Maximum Phonation Time (MPT):** MPT is a maximum performance task meant to assess the limits of respiratory/phonatory function. In this study, MPT was collected through the participants sustaining the vowel /a/ for as long as possible after maximum inhalation and was measured in seconds (s). There are many different reports for normal MPT. One commonly accepted norm MPT for adult males is 20 seconds.

**Phonation Quotient (PQ):** Phonation quotient refers to the rate at which air is expelled during sustained phonation. The PQ describes the ratio of vital capacity and MPT. The mean for PQ in adult males is 145mL/s.

**Maximum /s/ Duration:** This measure refers to the maximum amount of time the /s/ phoneme can be sustained. This measure indicates expiratory airflow. The mean for /s/ duration in adult males age 19-41 is about 25 seconds.

**Maximum /z/ Duration:** This measure refers to the maximum amount of time the /z/ phoneme can be sustained. This measure indicates expiratory airflow with vocal fold vibration. The /z/ phoneme requires phonation whereas the /s/ phoneme does not. The mean for /z/ duration in adult males age 19-41 is about 23 seconds.

**S/Z Ratio:** This measure is collected by comparing the durations of the /s/ and /z/ phonemes to observe laryngeal valving. A person with adequate laryngeal valving should be able to sustain both phonemes for the same about of time. Normal s/z ratio is approximately 1.0.
Appendix D

Treatment Fidelity Checklist October 11, 2011

(Loosely following the different steps included in the “Intermission Warm up” in Linklater’s *Freeing the Natural Voice* page 117)

The Touch of Sound:

Workday one: The spine, the support of natural breathing
_____ Rolling up and down the spine
_____ Lengthening the spine on the floor

Workday two: Freeing the breath, the source of sound
_____ Sighs of relief on 100% vibration
_____ Diagonal stretches
_____ The open book position
_____ Squatting

Workday three: The touch of sound:
_____ “Huh huh” on different pitches
_____ The pond

Workday four: Freeing Vibrations:
_____ Humming, up and down the scale on semi-tones, trying different pitches.
_____ Blowing through the lips
_____ Rolling up and down the spine and releasing the vibrations out by bouncing the knees, bouncing the shoulders, jumping up and down

Additional Comments, Notes or Observations (use back if needed):
Appendix E

Treatment Fidelity Checklist December 6, 2011

(Loosely following the different steps included in the “Intermission Warm up” in Linklater’s Freeing the Natural Voice page 117 and including exercises from workday six and seven starting on page 139)

The Touch of Sound:

Workday one: The spine, the support of natural breathing
   ______ Rolling up and down the spine
   ______ Lengthening the spine on the floor

Workday two: Freeing the breath, the source of sound
   ______ Sighs of relief on 100% vibration
   ______ Diagonal stretches
   ______ The open book position
   ______ Squatting

Workday three: The touch of sound:
   ______ “Huh huh” on different pitches
   ______ The pond

Workday four: Freeing Vibrations:
   ______ Humming, up and down the scale on semi-tones, trying different pitches.
   ______ Blowing through the lips
   ______ Rolling up and down the spine and releasing the vibrations out by bouncing the knees, bouncing the shoulders, jumping up and down

Workday six: Tongue Awareness:
   ______ Tongue Stretches
   ______ Tongue Loosening

Workday seven: The soft palate:
   ______ Inhaled/Exhaled “Kaah”

Additional Comments, Notes or Observations (use back if needed):
Appendix F

Voice Qualities of Actors
Voice Questionnaire
(Walzak, McCabe, Madill & Sheard, 2008)
Based on Sataloff, 1998

Subject Number __________________ Date _____ / _____ / _______
Age __________ Height ___________________
Sex __________ Weight ___________________
Occupation ________________________________________________

(1) How much do you use your voice at work every day: (please circle)
1–2 hours 2–4 hours 4–6 hours 6–8 hours more than 8 hours

(2) Do you use a loud voice at work? Yes/No

(3) Do you use a loud voice at home? Yes/No

(4) Have you ever had training for your speaking or singing voice? Yes/No
If “yes” please provide details (for how long, where, what kind of training): __________
______________________________________________
______________________________________________
______________________________________________
______________________________________________

(5) How much sleep do you get (on average) every night:
less than 4 hours 4–6 hours 6–8 hours 8–10 hours more than 10 hours

(6) Do you exercise regularly? Yes/No
If “yes” please give details:
______________________________________________
______________________________________________
______________________________________________

(7) How much alcohol do you drink?
______________________________________________

(8) How many cups of coffee, tea, cola, or other caffeine-containing drinks do you drink per day?
______________________________________________

(9) Have you ever smoked? Yes/No
If “yes” please provide details (for how long, how many, how long since you quit):
____________________________________________________
____________________________________________________
____________________________________________________
____________________________________________________
____________________________________________________
____________________________________________________
____________________________________________________

(10) Do you live or work in a smoky environment? Yes/No
If “yes” please give details:____________________________________________________
____________________________________________________
____________________________________________________
____________________________________________________

(11) List any other recreational drugs you use:________________________________________
____________________________________________________
____________________________________________________
____________________________________________________
____________________________________________________

(12) Have you noticed any of the following in the last 6 months? (please tick all that apply)

___ Voice worse in the morning  
___ Voice worse later in the day, after it has been used  
___ Frequently clear your throat  
___ Frequently experience sore throat / sensation in the throat  
___ Jaw joint problems  
___ Bitter or acid taste; bad breath in the morning  
___ Frequent “heartburn” or hiatus hernia  
___ Frequent yelling or loud talking  
___ Frequent whispering  
___ Chronic fatigue/insomnia  
___ Work in dry or dusty conditions  
___ Eat late at night  
___ Ever used antacids  
___ Frequent bad breath  
___ Lived or worked around smoke or fumes  
    If “yes” please give details:____________________________________________________

___ Frequently felt tired  
___ Work shift work  
___ Frequently thirsty/dehydrated  
___ Traveled recently: When _________________________________________  
    Where _________________________________________

(13) Have you noticed any changes in your voice in the last 6 months? Yes/No
If “yes please give details:____________________________________________________
____________________________________________________
____________________________________________________
____________________________________________________

(14) If “yes”, do you know what caused these changes? Yes/No
If “yes” please give details:____________________________________________________
____________________________________________________
____________________________________________________
____________________________________________________
(15) Did it come on slowly/suddenly? (circle one)

(16) Is it getting worse/better/same (circle one)

(17) Have you used your voice excessively (yelling/screaming) anytime over the last 6 months?
Yes/No
If “yes” please give details:

(18) Has any one commented on your voice? Yes/No

(19) Have you experienced any of the following in the last 6 months? (Tick all that apply)
___ Hoarseness (coarse or scratchy voice quality)
___ Vocal fatigue (voice tires or changes quality after speaking for a short period of time)
___ Difficulty speaking softly or loudly (circle which one applies)
___ Loss of vocal range (high/low)
___ Breathiness
___ Tickling or choking sensation when speaking
___ Pain in the throat when speaking
___ Loss of voice
___ Any other vocal difficulties/symptoms:

(20) Have you noticed any of the following in the last 6 months? (Tick all that apply)
___ Change in weight: gained/lost _____ kg in _____ weeks/months
___ Excessive sweating
___ Change in skin or hair
___ Palpitation (fluttering) of the heart
___ Numbness of the face or hands/feet
___ Double vision / Blurred vision
___ Confusion, dizziness, or loss of consciousness
___ Difficulty with speech
___ Difficulty with swallowing
___ Seizure (epileptic fit)
___ Pain/stiffness in the neck or shoulder
(21) Female subjects:

Are you pregnant? Yes/No

Are your menstrual periods regular? Yes/No

Have you undergone a hysterectomy? Yes/No

Were your ovaries removed? Yes/No

Have you gone through menopause? Yes/No

At what age did you reach puberty? __________

Are you currently menstruating? Yes/No

Are you currently ovulating? Yes/No/Don’t know

(22) Male subjects:

At what age did you reach puberty? _________

At what age did your voice break? _________

(23) All subjects:

Have you suffered from any of the following in the last 6 months? (Tick all that apply) If “yes” please provide details:

___Cough (lasting more than 1 month) _____________________________

___Bronchitis _____________________________

___Sinusitis _____________________________

___Colds and/or flu _____________________________

___Allergies _____________________________

___Asthma _____________________________

___Shaking or tremors
___Memory change
___Personality change
___Hearing loss
___Ear pain
___Facial pain
___Lump in neck, face, or head
___Ear noises
___Nasal obstruction/deformity
___Nose bleeds
(24) Are you taking any medication for the above? Yes/No
If “yes” please give details:

________________________________________________________

________________________________________________________

(25) Have you ever injured your head or neck? Yes/No
If “yes please give details:

________________________________________________________

________________________________________________________

(26) Have you been in any serious accidents? Yes/No
If “yes” please give details:

________________________________________________________

________________________________________________________

(27) Have you experienced any heightened emotional situations in the last 6 months (eg, death of a loved one, stress at work, disagreement with family)? Yes/No
If “yes” please give details:

________________________________________________________

________________________________________________________

(28) Have you experienced any heightened emotional situations in the last 24 hours? Yes/No
If “yes” please give only basic details:

________________________________________________________

________________________________________________________

(29) Please tick any that apply to you TODAY:
___ I feel tired/fatigued
___ I am thirsty/dehydrated
___ I feel anxious
___ I feel depressed
___ I feel angry
___ I feel upset

Thank you for your time in filling out this questionnaire.