ABSTRACT

THE EFFECTIVENESS OF VOCAL HYGIENE EDUCATION ON DECREASING AT RISK VOCAL BEHAVIORS IN VOCAL PERFORMERS

This study examined the improvement of overall knowledge of voice care and behavioral changes as a result of attending a vocal hygiene education (VHE) program. A quasi-experimental, single-group, pretest-posttest research design was utilized to examine the improvement of voice care knowledge and decrease of vocally abusive behaviors in vocal performers in the Fresno community at large. Pre-test and post-test scores from an online survey were compared in order to note improvement. Vocal self-perceptions were also incorporated into the survey. The findings from this study will contribute to evidence regarding the benefits of having vocal performers attend a VHE program in order to increase their knowledge about voice production and care, and to decrease behaviors that could be harmful to their voice.

Kristi Tekerlek
May 2018
THE EFFECTIVENESS OF VOCAL HYGIENE EDUCATION ON DECREASING AT RISK VOCAL BEHAVIORS IN VOCAL PERFORMERS

by

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A thesis submitted in partial fulfillment of the requirements for the degree of Master of Arts in Communicative Sciences and Deaf Studies in the College of Health and Human Services California State University, Fresno

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CHAPTER 1: INTRODUCTION

Vocal hygiene education (VHE) programs vary in regards to their content. However, most VHE programs share a number of common components, including information on (1) normal voice production; (2) identification and elimination of vocal abuse patterns; (3) the harmful effect of vocal abuse patterns on voice quality; (4) the importance of hydration; (5) the adverse effects of environmental irritants, smoking, and alcohol abuse; and (6) the potential impact that laryngopharyngeal reflux and certain medications might have on the voice (Yun, Kim, & Son, 2007). VHE is beneficial in helping to prevent voice disorders in at-risk individuals, such as those who use their voices professionally. Many also feel VHE can be an effective component in a treatment program for individuals with voice disorders. In fact, VHE programs are commonly recommended for individuals experiencing any form of dysphonia (Behrman, Rutledge, Hembree, & Sheridan, 2008; Bolbol, Zalat, Hammam, & Elnakeb, 2016; Chan, 1994; Duffy & Hazlett, 2003; Mathur et al., 2015; Pedersen, Bernova, & Møller, 2003; Yun et al., 2007).

Although VHE programs are commonly recommended for the prevention and treatment of voice disorders, the research supporting their use has been somewhat mixed. Some studies have stated that a VHE program is effective in reducing the self-evaluated perception of vocal difficulties and their impact as indicated by a drop in Voice Handicap Index (VHI) scores (Duan et al., 2010; Faham et al., 2015; Mathur et al., 2015; Pasa, Oates, & Dacakis, 2007), and a more stable voice quality (Yun et al., 2007). Others have found that, although individuals who participate in a VHE program may increase their knowledge about voice care (Pasa et al., 2007; Scrimgeour & Meyer, 2002), they may not
significantly decrease the frequency of vocally abusive behaviors (Broaddus-Lawrence, Troele, McCabe, Allen, & Toppin, 2000).

Several studies evaluated the effectiveness of VHE as compared to other forms of voice treatment (Behrman et al., 2008; Duffy & Hazlett, 2003; Leppanen, Laukkanen, Ilomaki, & Vilkman, 2009; Rodriguez-Parra, Adrian, & Casado, 2011; Roy et al., 2001; Roy et al., 2002). Further research evaluated the efficacy of treatment approaches that combined both direct approaches with VHE (Bovo, Galceran, Petrucelli, & Hatzopoulos, 2007; Fu, Theodoros, & Ward, 2014; Gillivan-Murphy, Drinnan, O’Dwyer, Ridha, & Carding, 2005; Hackworth, 2007; Ilomaki, Laukkanen, Leppanen, & Vilkman, 2008; Pizolato et al., 2013; Timmermans, De Bodt, Wuyts, & Van de Heyning, 2005). Generally, there seems to be support that VHE increases knowledge, but there is less support showing that it actually changes at-risk vocal behaviors. In addition, direct voice treatment approaches, or those that combined VHE with direct voice treatment, seem to be more effective than VHE alone.

A series of pilot studies conducted by two of the faculty at California State University, Fresno revealed a positive reaction to a VHE program that was introduced to vocal performers and vocal education students in the music department (Pomaville & Radford, 2013, 2014). Students who participated demonstrated significant increase in their knowledge of voice production, as well as, significant changes in reducing or modifying at-risk vocal behaviors. This finding led to the question as to whether VHE might be more effective in this particular population because students are highly motivated to take care of their vocal instruments. Therefore, the current study was developed to investigate the effectiveness of a VHE program administered specifically to vocal performers.
Research Questions

The present study addressed two research questions.

Question 1: Does participation in a VHE program increase knowledge about voice production and vocal hygiene in vocal performers?

Question 2: Does participation in a VHE program decrease vocally abusive behaviors in vocal performers?

The research hypotheses are as follows.

H1: Vocal performers who participate in a VHE program will demonstrate an increase in their knowledge about voice production and vocal hygiene as determined by a comparison of pre- and post-test measures.

H2: Vocal performers who participate in a VHE program will demonstrate a decrease in the occurrence of self-reported vocally abusive behaviors as determined by a comparison of pre- and post-test measures.

H0: Vocal performers who participate in a VHE program will neither increase their knowledge about vocal performance and hygiene nor decrease the occurrence of vocally abusive behaviors.

Definition of Terms

Hyperfunction: “Increased supraglottic tension or the presence of false fold adduction” (Sapienza & Hoffman Ruddy, 2013, p. 355).

Vocal abuse behaviors: Various behaviors and events that have some kind of deleterious effect on the larynx and the voice. Examples of vocal abuse behaviors include excessive yelling, coughing, smoking, throat clearing, or excessive crying (Boone, McFarlane, & Von Berg, 2005).

Vocal misuse behaviors: Abnormal vocal behaviors that cause stress or injury to the vocal folds (Sapienza & Hoffman Ruddy, 2013). Examples of vocal misuse behaviors include use of inadequate breath support, excessive loudness,
speaking with hard glottal attacks, use of an inappropriate pitch, or overuse of the voice (Boone et al., 2005).

At-risk vocal behaviors: For the purpose of this study, the term at-risk vocal behaviors included any vocal abuse or misuse behaviors, as described above.

Vocal hygiene: Program of vocal health, usually introduced in voice therapy, that preserves the vocal fold tissue and normal vibratory characteristics of the vocal folds (Sapienza & Hoffman Ruddy, 2013). Vocal hygiene programs may include all or some of the following components: counseling or education regarding voice production, the identification and elimination of vocal misuse and abuse behaviors, an emphasis on proper hydration, and strategies for healthy voice production (Stemple, Roy, & Klaben, 2014).
CHAPTER 2: LITERATURE REVIEW

A thorough and detailed review of the literature pertaining to the effectiveness of VHE was completed. In the past, there have been multiple studies conducted to evaluate different voice treatment techniques with a range of populations who use their voices professionally. Voice treatment can be a form of direct intervention which includes one-on-one speech therapy or surgery, an indirect intervention which includes VHE, or a combination of both.

In today’s society, more than one-third of individuals in the work force use their voice as a primary tool (Boltezar & Sereg Bahar, 2014). Commonly, the term professional voice user refers to those professionals who depend on their voice in order to perform a certain job. Previous studies have highlighted top professions that rely the most on voice use and have categorized them into four levels: “the elite vocal performer (singers, actors), professional voice user (clergy, lecturers, telephone operators), the non-vocal professional (teachers, doctors), and the non-vocal non-professional (laborers, clerks)” (Boltezar & Sereg Bahar, 2014, p. 304). This list has further been defined by the amount of vocal load put on the individual and the vocal demand needed. Vocal load is defined as the stress put on the vocal mechanism during extended speaking (Odom, 1996). Vocal performers, such as singers or actors, are valued for their vocal quality, which can cause their vocal load to be high. Teachers, on the other hand, are not necessarily valued for their vocal quality, but are required to use their voices throughout the day, so their vocal load is also high. This literature review will focus on previous research that evaluated the effectiveness of VHE with variety of populations.
The Importance of Vocal Hygiene Education

To understand the background of this study, it is important to comprehend the makeup of VHE programs and how they have been used in previous studies. Researchers have looked at this form of indirect therapy on a multitude of populations that vary greatly in regards to the vocal demands placed upon them. In addition, several studies have identified a need for increased VHE in several populations.

Timmermans, De Bodt, Wuyts, and Van de Heyning (2003) administered a questionnaire on vocal hygiene knowledge to future professional voice users and professional voice users and analyzed the responses qualitatively and quantitatively. Twenty-seven radio students and 53 radio professionals were selected from the Rits, a school for audiovisual communication, and employees of Flemish Radio and Television. The students’ mean age and experience was 22 years old with no professional experience. The professionals’ mean age and experience was 41 years old with 2 to 32 years of experience in the field. The vocal hygiene questionnaire included questions on certain risk factors, such as smoking, alcohol consumption, and acid reflux. Questions on voice-related factors investigated the participant’s perception of allergies, hoarseness, singing activity, vocal stress, and vocal fatigue. The questionnaire was first distributed to the radio students, and then it was distributed to the professionals for further analysis.

Results of this questionnaire did not support the hypothesis put forth by the researchers that radio professionals would have better vocal hygiene than radio amateurs. In contrast, they found that radio professionals drank more coffee, reported having more vocal fatigue, and suffered from stress. It was also reported that radio students indicated having more hoarseness and acid reflux. Both groups indicated smoking too much. These authors concluded that future research should
be conducted on finding an effective vocal hygiene program for professional voice users.

Latham et al. (2016) conducted a survey-based research study, which was analyzed both descriptively and statistically, to determine the amount of education graduate-level vocal performers received on vocal health. Along with this, they sought to determine who provided the instruction and what kind of affiliations they had with medical professionals. These researchers distributed a national online survey through multiple music schools. Potential participants included individuals belonging to the National Association of Schools of Music that offered graduate-level music classes. Respondents, who were defined as the most knowledgeable person at each institution and who agreed to participate, were sent a link to the online survey. The survey included questions on demographics, the amount of VHE provided at their institution, who taught the programs, and any medical affiliations available for the graduate music students. Participants only had to complete 90% of the survey to be included in the survey.

Through this research, it was concluded that many institutions provide some form of vocal health education to their graduate singing students. It was also shown that these singers believed their primary source of information regarding vocal health should be singing teachers, and that they would seek out medical professionals when they were experiencing voice problems. According to the survey responses, 95% stated their institution included some form of instruction on vocal physiology and health, and 55% of these respondents reported that medical professionals provided none of the vocal health instructions. In 29% of the schools, the course on vocal health was an elective and not required for their students. Some schools indicated that these courses were offered at the undergraduate level, and that graduate-level students did not have to take them
during their graduate studies. Interestingly, respondents also strongly agreed (99%) that vocal health instruction should be provided to their graduate students. It was noted that the top three barriers to providing more vocal health instruction included, “limited time in curriculum, lack of financial support, and lack of availability of medical professionals” (Latham et al., 2016, p. 5). In addition, it was concluded that respondents did not distinguish between music teachers or medical professionals as being better suited to provide instruction on vocal health. Moreover, based on the responses provided, the researchers concluded that students find that VHE is important, especially at the graduate level, thus supporting the importance of finding an effective program.

Although this research adds valuable knowledge on the amount of vocal health education that is being provided to graduate level singers, there are a few drawbacks that should be noted. First, only one survey was distributed to each school, and the most informed individual filled it out. Although the researchers sought to find the most informed individual, each participant may have had varying levels of familiarity with the subject matter at their school, which could have introduced bias. Also, it should be noted that the responses were based on the individual’s opinions, which may not have matched the opinions of the program as a whole.

Hackworth (2006) conducted a study to better understand the perceptions of vocal hygiene knowledge in preservice music teachers. This researcher distributed a questionnaire to undergraduate students, then conducted a qualitative and quantitative analysis of the data gathered. The participants were 140 music education undergraduates from five universities throughout the United States, all with similar sized music education programs. Only undergraduate students with no prior contractual teaching experience were allowed to participate. Participants
were given a written survey about their knowledge and behaviors regarding their voice. Information gathered included participants’ opinions about their personal voice use and how it might impact their teaching careers in the future. They were also asked to speculate how many hours they would use their voice in the different modalities of teaching (i.e., giving verbal instruction, planning, singing, playing an instrument, rehearsal). Also, the survey questioned the participants’ familiarity with the term vocal hygiene and how they rated the teaching profession to be at risk for voice disorders. Of these participants, 36 indicated voice as a primary or secondary instrument, and 112 indicated an instrument other than voice as primary.

Results of this survey showed that there was no clear majority opinion on how many hours preservice teachers would use their voices each day during instruction. An interesting point that was concluded from the survey was that 56% of the respondents believed that they would spend 2 to 3 hours rehearsing after school, while 55% believed they would sing less than 2 hours during the entire day. This may indicate that respondents did not fully understand each question or that they did not have a clear understanding of what their role as a music educator would be. Sixty percent of respondents believed a voice disorder would affect their career, indicating they had a strong awareness of the risks teachers face. A majority of the respondents indicated they would not consider changing careers if a voice problem occurred, but those who would or might consider changing careers totaled 32%. Lastly, familiarity with the term vocal hygiene, or care of the voice was around 50%, which indicated a high degree of unfamiliarity with the terminology. Although participants demonstrated a lack of understanding of the terminology, they had strong opinions about healthy and unhealthy behaviors and conditions relating to voice care.
Although this study utilized a survey that included questions on a broad spectrum, future research should be done to ask more specific questions about how respondents will use their voices. The use of more specific questions will help to answer more pertinent questions based on vocal stresses in teaching activities. Also, future research should include the analysis of the different classes of undergraduate courses, for example, comparing freshman, sophomore, junior, and senior year respondents. This would help to show the progression of perception during the course of completing a degree. Lastly, receiving input from experienced music teachers might help to identify what preliminary information is the most important for increasing awareness in preservice teachers.

Hackworth (2009) further expanded her former study by comparing the perceptions of vocal hygiene in music teachers at different levels of experience. Participants (N= 659) were stratified into three groups depending on their teaching experience: late career (11 or more years of experience), early career (1-10 years of experience), and preservice (no teaching experience). The survey used in Hackworth (2006) was further refined and used in this study. The survey was distributed online, as opposed to the written format in the previous study. Questions on the survey pertained to, “voice use while teaching, familiarity with the term vocal hygiene, healthiness of vocal behaviors, vocal stress associated with selected teaching activities, and personal experience with vocal problems” (Hackworth, 2009, p. 77). Participants were also asked about risks associated with teaching and if they would consider changing careers if a voice problem were to occur. The survey included a section where participants rated the frequency of behaviors, such as, throat clearing, consuming caffeine, and so forth, as well as rated perception of teaching activities, such as, verbal instructions during instrument playing, and speaking in a noisy classroom.
Results from this study provided a better understanding of the perceptions of vocal hygiene in participants with music teaching experience at different levels. Familiarity with, and an understanding of, the term vocal hygiene was found at all three levels of experience, which suggests that many teachers may already possess some knowledge to help prevent voice problems. Both groups of experienced teachers rated *speaking in a noisy environment* as a higher level of being harmful than the preservice teachers. This may suggest that the length of teaching experience may correlate with a better understanding of the negative impact it has on vocal health. This trend was opposite for the consumption of water, meaning less experienced teachers believed that consuming water was healthier than the experienced teachers rated it. It was also found that all teachers believed that the teaching profession is at higher risk for developing a voice disorder, in which the percentages increased as the level of experience increased. This belief did not change the teachers’ thoughts about changing careers to preserve their voices. This suggested that their love of teaching far outweighed the need to change career paths. Overall, these findings suggested that although preservice teachers may have a valid perception of how certain behaviors affect vocal health, it ultimately takes experience within the profession to have a deeper understanding of these issues.

Results from this study provide information on how different levels of experience in music teachers affected their thoughts about vocal hygiene. Hackworth (2009) suggested that further research should be done on the best way to implement a VHE program during teachers’ preservice years.

Vetter (2016) created a questionnaire in order to better understand “what students at the collegiate level know about vocal anatomy, physiology, and vocal hygiene issues” (p. 12). Sixty-two participants were recruited from the University
of Kentucky Opera Theater Department, in which all were enrolled in voice lessons as either an undergraduate or graduate student. It was stated that at the time of this study, the university offered one class on vocal anatomy and physiology and one class on vocal pedagogy for the master’s and doctoral students, and none were offered to the undergraduate performance students.

Results of this study showed that in order to reduce the effects of voice disorders in singers and teachers, it is important to educate them on how the voice functions and how to take care of it. An analysis of the results showed that graduate students answered more questions correctly than undergraduate students on the first part of the questionnaire, which had to do with anatomy and physiology of the voice. The second section of the questionnaire focused on vocal hygiene, and overall, there were no significant differences between the levels of education. It was concluded that, “pedagogy courses should be devoted to speaking habits, anatomy and physiology, reflux, medical management, and how these contribute to or detract from efficient voice use” (Vetter, 2016, p. 47). These findings were then applied to recommendations for future pedagogy classes offered at this university.

In summary, the studies described above supported the importance of VHE for vocal professionals, and more specifically, vocal performers. Timmermans et al. (2003) and Hackworth (2009) identified a need for VHE due to the high incidence of voice problems in this population, as well as the high degree of vocal demand placed on these individuals. In addition, several studies identified the need for more vocal health instruction in the curriculum of programs preparing vocal performers and music educators (Hackworth, 2006, 2009; Latham et al., 2016; Vetter, 2016).
**Treatment Studies**

A number of researchers have investigated VHE as a treatment method for individuals with voice disorders. The following studies have incorporated VHE as a part of a treatment method. These studies include the use of VHE alone, VHE combined with other forms of voice treatment, or a comparison of VHE to other treatment methods.

**Vocal Hygiene**

Many researchers have studied the effects of VHE as a sole treatment on different populations. Broaddus-Lawrence et al. (2000) explored the effects of VHE on vocal behaviors and perceptual vocal characteristics of untrained singers. Researchers recruited 11 adult participants from the undergraduate class at East Carolina University. The inclusion criteria consisted of no prior diagnosis of a voice disorder, no history of speech therapy, no formal vocal hygiene training, and no more than 2 years of classical voice training. The participants attended four, 1-hour classes, taught by the same instructor, that addressed four vocal hygiene topics: anatomy and physiology of the phonatory mechanism, vocal abuse and misuse, laryngeal pathology secondary to vocal abuse, and instruction on healthy voice techniques. Topics of discussion included the anatomy and physiology of the phonatory mechanism, vocal abuse and misuse, laryngeal pathologies, treatment techniques, and healthy alternatives.

Analysis of the results showed no statistically significant decrease in the number of vocally abusive behaviors reported by the participants following participation in the VHE program. Second, analysis of the results showed no significant changes in the subjects’ practice of good vocal hygiene behaviors, which included vocal warm-up exercises and water intake. Third, subjects’ perceptions of their singing and speaking voices were not significantly changed,
although there was a general trend toward improved perceptual vocal characteristics. Fourth, although there was a slight increase in the subjects’ perceptions of their use of good vocal hygiene, a significant difference was not noted. Lastly, the participants’ responses to a number of statements indicated they felt that the VHE program was beneficial. Despite the fact that statistically significant changes in the dependent variables did not occur, it was reported that VHE served as a positive experience for the participants.

Scrimgeour and Meyer (2002) conducted a research study on the effectiveness of an interactive educational program on changing vocally abusive and hearing behaviors in kindergarten children. This study used *Ears for Listening, Voice for Speaking* (ELVS) as the educational program with 66 kindergarten students (34 female and 32 male). The ELVS program was a 45-minute interactive presentation on hearing conservation and vocal hygiene, specifically designed for younger children. Information was presented through hands-on demonstrations, large visual prompts, and opportunities for the students to practice. The hearing section focused on anatomy, the importance of regular medical care, the non-threatening nature of hearing screenings, and prevention. The voice section covered the topics of anatomy and prevention. All of the hearing and voice topics were covered using age-appropriate terminology.

A questionnaire was administered before and after the ELVS program to assess its effectiveness. Twenty questions were used to assess the students’ knowledge of the normal mechanisms for hearing and voice, the causes for hearing and voice disorders, and alternatives to abusive behaviors. All questions were kept simple, requiring dichotomous answers in which a smiley face was used for *yes*, and a frowning face was used for *no*. The questionnaire was administered 1 week prior to the ELVS program and again 1 week after the program. Results of
the pre- and post-ELVS scores were analyzed through descriptive statistics and the Wilcoxon Matched-Pairs Signed-Ranks Test.

Results of this study indicated that, through participation in an education program such as ELVS, kindergarten students were able to significantly increase their overall knowledge of voice and hearing. There was over a 17% increase in knowledge between the pre-ELVS and post-ELVS results. The ELVS specifically targeted kindergarten students in order to better prepare them for audiological screenings that would occur later in the school years. Although this study focused on children between the ages of 5 and 6, further research should be done to determine the most appropriate age to begin awareness training. Further analysis revealed that the students’ knowledge of voice was much lower than their knowledge of hearing. It was also shown that almost half of the students had no knowledge of the anatomy of the vocal mechanism, possibly due to it being hidden in the larynx, as compared to the more visual parts of the ears. Data from this study suggested that more attention and time should be spent on educating students on reducing behaviors that could cause a communicative disorder, and that this may be achieved through programs such as the ELVS program.

Achey, He, and Akst (2016) studied the compliance of classical singing students to a vocal hygiene program, as well as the link between self-reported vocal practices and vocal handicap. The researchers hypothesized that increased attention to routine vocal hygiene practices will relate to reduced voice handicap. A survey was distributed to two major conservatory voice programs, including Eastman School of Music in Rochester, New York, and the Peabody Institute in Baltimore, Maryland. Demographics, vocal hygiene practices, risk factors for voice problems, and singing voice handicap were assessed through the use of the survey. Subjects were selected based on their feasibility and representation of the
voice programs they attended. The surveys were distributed and collected anonymously by vocal pedagogues at each institution. Primary outcome measures were based on vocal hygiene recommendation adherence in both performance and nonperformance periods, assessed using a vocal hygiene index created by the study team, and the participant’s level of vocal handicap measured using the Singing Voice Handicap Index-10 (Cohen et al., 2007). Secondary outcome measures included vocal health history, length of training, and primary goals for singing.

The vocal hygiene index that was used throughout the study was developed based on previous studies, and asked respondents to rate how often they considered each of the 11 common vocal hygiene recommendations on a Likert scale. Vocal hygiene and vocal health factors assessed included, “amount and duration of speaking and singing voice use, noisy environments, water intake, diet, amount and/or quality of sleep, amount and/or type of physical exercise, caffeine intake, stress reduction, gastroesophageal reflux disease/reflux effects and prevention, and medication effects” (Achey et al., 2016). The index was repeated on multiple occasions, which included periods before a performance.

Results were based on the completion of 63 surveys from the Eastman School of Music, and 45 completed surveys from the Peabody Institute. An elevated degree of vocal handicap and a higher time commitment to the 11 common vocal hygiene factors were reported by the conservatory students of classical singing when they prepared for performances. In addition, it was found that attention to the vocal hygiene factors was not associated with voice handicap (measured by Singers Voice Handicap Index-10). However, greater consideration of stress reduction in both performance and nonperformance periods correlated significantly with increased vocal handicap and greater consideration of singing
voice use in performance periods correlated significantly with decreased vocal handicap. These findings suggested that when singers consider stress reduction, there was a rise in vocal handicap, which resulted in their experience of higher stress levels in academic, music, social, and other situations. It is important to note that this is the only significant vocal hygiene practice in this study to demonstrate a significant effect on vocal handicap in both nonperformance and performance preparation periods. Findings revealed that singers may have stronger attitudes towards the stress they experience rather than the stress itself. This means that those who focus more on stress reduction may actually feel the effects of stress more. Overall, the researchers reported that these findings were consistent with previous studies indicating that education on vocal hygiene practices were less effective than voice therapy as preventative treatment for phonotrauma. It was also shown that VHE for singing students did not effectively reduce potentially phonotraumatic behaviors.

Duan et al. (2010) performed a case-control study in China on the effectiveness of a voice-training program on middle school teachers. Thirty-six full-time teachers in Beijing were randomly selected for participation and were further separated into a control group (12 participants) and a treatment group (24 participants). All participants had some form of voice symptoms, such as hoarseness and pain in the throat while speaking, lasting more than three months, with accompanying mild edema, congestion, or hypertrophy. The voice-training program covered three topics, including VHE, group voice training, and homework exercises. The VHE session lasted an hour and was conducted for the whole treatment group. The group training sessions were administered to the participants in groups of four and lasted 60 minutes each. Homework practice was
done every day for a month. Statistical analysis was based on VHI measures, acoustic analysis, and maximum phonation time measurements on the voice.

The researchers concluded that there was a significant decrease in the participants’ VHI scores after treatment, and no statistical significance was noted for the control group. This indicated that the voice-training program can reduce vocal symptom disturbances of teachers. Treatment effectiveness may be explained by the program’s instruction on facilitating respiratory support for phonation and the use of resonance to help create a louder voice. Also, it was emphasized that including exercises to relax the larynx and neck muscles helped to reduce the burden on the larynx, thus reducing physical discomforts noted by participants in the VHI scores.

Faham et al. (2015) conducted a study to assess the effectiveness of a voice education program “using appropriate and accessible methods on reducing self-reported vocal symptoms of female elementary school teachers in Iran” (p. 1). The researchers’ review of previous studies found that research did not point in a clear direction regarding the effectiveness of a voice education program in decreasing vocally abusive behaviors. This led the researchers to conduct their own study, using a pretest-posttest control group design; they selected ten out of the 50 public schools in Shiraz city, and randomly assigned five to the control group and five to the training group. The training group went through an 8-week program, one 1-hour session each week. The sessions included discussions on how the voice is produced, how to protect the voice and larynx, how to identify abusive vocal behaviors, and how to substitute abusive behaviors. The control group received pamphlets and handouts on the information presented in the training programs. Voice measurements were obtained at the start and end of the study, through the use of the VHI questionnaire.
The results of this study supported the effectiveness of a voice education program for teachers. The change in the total VHI scores for the training group decreased (improved) by more than 7 points. The scores for the control group increased (worsened) by 3.5 points. The researchers based these results off of a previous study’s clinical significance level of 18 points being considered clinically significant. The results of this study did not meet this level of clinical significance, however, there was an increase of 7 points, showing some improvement. As for the control group, it was suggested that the increase in VHI scores may have been due to high educational loading at the time of the post-test administration, as presented by the Iranian elementary syllabus.

Mathur et al. (2015) conducted a study to assess the efficacy of voice therapy sessions for treating voice disorders in teachers. This study used a more comprehensive vocal hygiene program, which included direct teaching of the different components of vocal hygiene. The researchers recruited 15 teachers that had some form of abnormal voice quality due to dysphonia. A thorough case history was completed to gather information on various parameters such as: voice use, vocal hygiene and vocal well-being, muscular tension, anxiety and stress, use of oral contraceptives and hormones, and smoking habits. In addition, a family history was gathered, and a self-assessment of voice was completed. Pre-test aerodynamic and perceptual measures were recorded for all participants before the start of the study, using maximum phonation time, the s:z ratio, and the Consensus Auditory-Perceptual Evaluation of Voice (CAPE-V). Participants were then separated into either the voice therapy group or the control group based on their ability to attend the voice therapy sessions. Those who could not attend the sessions were placed into the control group and did not receive treatment. Voice therapy consisted of five phases that included vocal hygiene, relaxation, breathing,
production and placement, and carry over. Post-test measurements were completed for both groups at the completion of the voice therapy sessions, and were the same as those conducted for the pre-test measures.

Results from the case history indicated that participants in both groups had vocal nodules and vocal congestion due to vocal abuse and misuse, which can be contributed to the high vocal demand associated with being a teacher. There was also an increase in maximum phonation time, between pre- and post-test measures for the treatment group, and no significant difference for the control group. These results were similar for the s:z ratio, in which there was a positive change between pre- and post-test measures for the treatment group, and no significant difference for the control group. Lastly, results of the CAPE-V indicated a positive significant difference for the treatment group, and no significant difference for the control group. Results of this study indicated that voice therapy had a positive impact on voice quality of teachers. The researchers recommended that professional voice users, such as teachers, should attend voice therapy and vocal hygiene programs to conserve their voices since they have to put more load on their vocal mechanism.

VHE research has also been conducted on individuals with vocal polyps. Yun et al. (2007) conducted a study to evaluate the effectiveness of a one-time VHE course on individuals diagnosed with a vocal polyp. Voice evaluations and a single session of vocal hygiene were routinely given to each of the 340 participants who were just diagnosed with a vocal polyp. The VHE program was a 9-minute video that included all the standard information on vocal hygiene for benign hyperfunctional laryngeal disorders. One hundred sixty-five participants dropped out of the study or did not make it to the follow-up evaluation 3 months later. Once the follow-up measurements were obtained, participants were further
separated into either the improvement group (67 participants) or the no improvement group (108 participants). Based on these results, the improvement group received further education on vocal hygiene and the no-improvement group was evaluated for surgery.

By participating in this study, those who were originally diagnosed with vocal polyps were given a chance to rid the pathology through the use of a VHE program. Study results showed that 20-38% of individuals who received VHE did not need surgical intervention. All of the participants, having received VHE, reported a more stable voice quality and a reduction in reflux symptoms.

Chan (1994) conducted a study to investigate the effectiveness of a vocal hygiene program on an occupational group at risk for dysphonia, specifically, kindergarten teachers. Twenty-five female kindergarten teachers were randomly separated into either the experimental or control group, and had their voices instrumentally analyzed. The experimental group attended an hour and a half workshop on vocal hygiene and was instructed to practice daily at home for 2 months. Workshop topics included a discussion of the normal vocal mechanism, pathologies of the larynx, vocal abuses and their consequences, healthy vocal use, and strategies to maintain classroom order without abusing the voice. The control group did not receive any information on vocal hygiene. After the 2 months, post-education assessments using the same instrumental voice analysis used in the pre-test were conducted.

Results of this study suggested that kindergarten teachers were able to improve their voices through a vocal hygiene course, regardless of their age or years of experience in the field. Many teachers who participated in the experimental group showed significant voice improvement, whereas the control group showed no significant change in voice. Teachers noted that the program was
helpful because they were able to reduce vocally abusive behaviors and were able to use compensatory strategies to maintain classroom order. The researcher suggested future research should investigate the effectiveness of this program on teachers in other educational settings, including the effects it has on the pupils, and the varying extents of vocal abuse the participants have.

Bolbol et al. (2016) conducted a comparative cross-sectional study to measure the effectiveness of a vocal hygiene awareness program on improving the knowledge of voice care and reducing the voice-related symptoms in Egyptian teachers. Using a multistage stratified random sampling technique, 165 participants were selected to be a part of the treatment group, and 180 participants were selected to be in the control group. Two phases were completed during the course of this study. Phase 1 consisted of a self-administered questionnaire that gathered information regarding demographics, voice-related symptoms, VHI scores, and the teachers’ knowledge of voice care. The second phase included participation in a vocal hygiene program. The same questionnaire was delivered after the vocal hygiene program, as well as an opportunity for the participants to have their vocal folds clinically evaluated through videolaryngostroboscopy.

Results of this study indicated that 58.3% of the participants used a loud voice in the classroom, due to the large class size. The most frequent voice-related symptoms included hoarseness, dry throat, vocal tiredness, and frequent throat clearing. A comparison of voice-related symptoms experienced by participants working in elementary, middle, and high school settings revealed no significant differences, which could be attributed to the high similarity of public schools in Egypt. It was also shown that the teachers who participated had no previous education on voice care and that the knowledge they had was obtained through their own initiative. Through the application of the VHE program immediately and
after 3 months, the results of this study showed statistically significant improvement in teacher’s knowledge in all aspects of vocal hygiene tips, except for avoiding smoking which showed a high percentage in both the pre- and post-tests as most of the studied subjects were non-smokers. The positive changes and level of significant improvement reported in this study may be due to the fact that those who participated were highly motivated to resolve their voice problems and improve their voice quality. Also, when comparing results reported immediately to those reported after 3 months, there was overall a significant drop in healthy behaviors, especially in consuming healthy food, avoiding spicy food, and avoiding excessive caffeine. These results may be attributed to a personal preference for spicy foods and caffeine. After the intervention, 103 teachers agreed to be subjected to a free videolaryngostroboscopic examination. The results revealed that almost 60% had normal laryngeal imaging, over 20% had chronic nonspecific laryngitis, and about 18% had a pathologic lesion. Overall, the VHE program used in this study decreased most of the vocally abusive behaviors as noted by the participants.

The current study was designed to expand upon the findings of two previous pilot studies that were conducted as a collaborative effort between the Communicative Sciences and Deaf Studies (CSDS) Department and Music Department at California State University, Fresno (CSUF). Results of the first pilot study (Pomaville & Radford, 2013) were presented at the California Speech, Language, and Hearing Association annual convention in Long Beach in Spring 2013. Results of the second pilot study (Pomaville & Radford, 2014) were presented at the American Speech, Language, and Hearing Association Healthcare and Business Institute in Las Vegas in April, 2014. Since these two pilot studies
served as the inspiration and foundation for the current study, they warrant further review.

In the first of these, Pomaville and Radford (2013) formulated a VHE program with an accompanying questionnaire. The VHE program consisted of four class periods covering several aspects of vocal hygiene. The first two class periods included topics on basic laryngeal anatomy and physiology, and the importance of healthy voice production for vocal performers. The third class period consisted of a discussion on vocal abuse and misuse behaviors, different reflux disorders, and the principles of vocal hygiene. The last class period was conducted in the voice lab on campus where students viewed videos of healthy vocal folds and those with common pathologies. Willing participants were able to have videolaryngostroboscopy performed at that time. This VHE program was presented to the Music Department’s Vocal Pedagogy class during the Spring 2012 semester, and a follow-up questionnaire was administered 10 weeks later to assess student learning and the resulting behavioral changes that occurred as a result of the program. Due to the small class size (12 students), data were limited, but the results clearly showed positive changes in the students’ vocal awareness and behaviors. Therefore, it was decided to replicate the study with a few changes to the questionnaire, and more participants.

For the second pilot study, Pomaville and Radford (2014) presented the same VHE program to students in the Vocal Pedagogy and Vocal Performance classes at CSUF and the Vocal Performance class at Fresno City College (FCC) during the Fall 2013, Spring 2014, and Fall 2014 semesters. Participation was voluntary, resulting in a total of 35 participants who completed the follow-up survey. Once again, the results of this pilot study showed positive outcomes for the students who participated in the VHE program. Of those who responded to the
survey, 85-100% self-reported increased knowledge of the topics discussed during the program, including (1) the anatomy and physiology of voice production, (2) how pitch and loudness are adjusted when singing, (3) variables that can affect the quality of voice, (4) laryngeal tension/hyperfunction and how it can affect voice, (5) vocal abuse and misuse behaviors, and (6) vocal symptoms that might indicate something is going on in the larynx. Results also revealed self-reported positive changes regarding vocal behaviors secondary to participation in the VHE unit. Sixty nine percent of the participants reported changing their vocal technique based on what they learned, 83% changed their hydration regimen and increased their water intake, 49% changed their practice routine, 83% incorporated vocal rest into their regimen, and 97% modified or eliminated at risk vocal behaviors. It was also shown that 94% of the participants were able to identify at least two modifying behaviors that could decrease their risk of laryngeal hyperfunction, and 69% reported becoming more concerned regarding physical issues impacting their voice. These findings suggested that participation in a comprehensive VHE program, such as the one in this study, has the potential to improve knowledge about voice production, improve voicing practices, and decrease at risk vocal behaviors in vocal performance students at the college level. These findings became the inspiration behind the current study.

Vocal Hygiene Compared to Other Treatments

The following studies were designed to compare different forms of voice treatment to a VHE program. Behrman et al. (2008) conducted an experimental study to assess the effectiveness of VHE and voice production therapy (VPT) in altering patient perception of vocal handicap and the role of the adherence in that perception. The researchers recruited women who were 18 years and older and had
a recent (within 3 months) diagnosis of bilateral, fairly symmetric, mid-membranous, benign, free-edge vocal fold lesions. Lesions in this study were described mainly as being pre-nodules and mid-fold swelling, as well as other pathologies. Individuals with nodules were excluded from the study. Inclusion criteria consisted of: being recommended for voice therapy as the definitive treatment, experiencing the symptoms for at least 3 months, having not smoked within the prior 3 years, speaking and understanding English, and generally being in good health. Sixty-two female participants were recruited from the clinical practices of otolaryngologists in New York City. Through a computer-generated random number list, participants were randomly assigned to either the VHE or VPT group. A multigroup pretest-posttest design was used to assess participants’ responses at baseline, immediately after treatment, and again after 4 weeks of self-study. Each group went through 6 consecutive weeks of 45-minute private sessions. The VHE group received information on broad concepts relating to voice hygiene and was not introduced to vocal exercises. The VPT group received Lessac-Madsen Resonant Voice Therapy, which targets a phonation strategy referred to as resonant voice production. The goal of this treatment is to produce strong harmonic structure without hyperadduction of the vocal folds.

The primary outcome measure used in this study was the participant’s self-adherence as determined by VHI scores. Both groups achieved a statistically significant decrease in VHI scores from baseline to completion of the study, although the VPT group decrease was significantly greater. Three main outcomes were concluded from this study. First, it was proven that 6 weeks of VPT was more effective than a similar amount of time for VHE. Second, those who considered themselves to be adherent to the treatment protocol obtained better outcomes than those who considered themselves to be non-adherent. Last,
participants in the VPT group, who adhered to the treatment, benefitted from the self-study period, more so than those in the VHE group.

Duffy and Hazlett (2003) conducted a longitudinal study to find a primary prevention tool for those affected by occupational dysphonia among teachers. Amidst 200 students going through the Postgraduate Certificate in Education at the University of Ulster, Jordanstown, 55 individuals volunteered to participate in the study. The 55 individuals were then randomly placed within three groups: 23 in the control group, 20 in the indirect group, and 12 in the direct group. The indirect group received instruction and information on the mechanics of healthy voice production, behaviors that are vocally abusive, and changes they could make in their lifestyle and diet. Alternatively, the direct group received more focused training on correct posture, correct respiration, healthy resonance, voice projection, and techniques to relax tension in the larynx. The control group did not receive any form of treatment. Baseline measures were completed for all groups prior to the beginning of the treatment sessions, and again after the sessions. Baseline measurements were completed using acoustic measurements of voice quality through the use of a dysphonia severity index (DSI), MPT measurement, and perceptual testing of their voice through questionnaires. Two forms of questionnaires were incorporated within this study: the Vocology Screening Profile, designed by Hazlett, and the VHI.

The results to date of this ongoing study were not found to be statistically significant, but some results were approaching significance. For the control group, the DSI and self-perceptual scores decreased, which represents a deterioration of voice quality. The authors assumed this was due to not receiving any voice training. Although these scores decreased, the VHI scores increased, indicating an improvement of voice impact. The indirect group demonstrated limited change
over time, showing stagnation, but not deterioration. Deterioration on the self-perceptual scales was evident, which could have been caused by raised awareness from training. Although their self-perceptual scores decreased, their acoustic performance stayed the same. Lastly, the direct group showed the most improvement in the acoustic measurements, but demonstrated no change in self-perceptual scales, although there was a positive trend of improved voice quality. This imbalance of scores could be due to the fact that the trainings caused a rise in self-awareness of voice quality, but the direct treatment actually improved acoustic measurements of voice quality over time.

Attrition throughout the study was noted due to the direct treatment’s time constraints on the participants. This resulted in unequal numbers throughout the groups, which then resulted in fewer measurements to compare between groups. Despite these limitations, this study offers some support regarding the effects of both vocal hygiene courses and direct voice training.

Roy et al. (2001) conducted a study to assess the functional effects of two common voice therapy techniques, VHE and vocal function exercises (VFE). The researchers used a prospective randomized clinical trial that lasted 6 weeks. The VHI was used to measure self-perceived psychosocial consequences of voice disorders in the VHE, VFE, and non-treatment control groups before treatment and following the 6-week treatment phase. Sixty full-time primary and secondary school teachers with a history of voice problems were recruited for this study, and randomly assigned to one of the three groups. Eleven speech-language pathologists (SLPs) were recruited and trained to conduct either the VFE or VHE lessons. The VHE program was adopted from Morrison et al. (1994), but minor adjustments were made before it was conducted. Procedures for this study consisted of four meetings with the experimental groups. The first meeting
consisted of collecting VHI scores and a review of the material. During the subsequent meetings, clinicians went over the material that was provided to the participants in the first meeting. During the final meeting (6 weeks post-treatment), a second VHI score was collected. To supplement the VHI scores, participants in both treatment groups (VFE and VHE) completed a four-question, post-treatment questionnaire about perceived voice improvement and compliance to the treatment procedures.

Results of this study suggested that teachers who have a voice problem may benefit more from VFE than with VHE, or no treatment at all. It was shown that participants in the VHE group and the control group did not experience any significant change in VHI scores following the 6-week period of the study. When comparing the VFE group to the VHE group, the VFE group reported an overall voice improvement, characterized by greater ease and clarity when speaking and singing.

Roy et al. (2001) concluded that VHE does not produce the desired treatment results, especially for voice-disordered teachers. Before these results can be generalized, there are some important limitations to consider. First, the VHE program used in this study was primarily didactic, meaning participants did not receive a more direct form of treatment, such as VFE, in conjunction. Often times, voice treatment combines both instruction and more active approaches. Secondly, the exact nature of the voice disorders included in the study were not fully defined, in which further research should include more measurements to precisely define the disorders. This can help to show what pathologies are more reactive to the different forms of treatment. Third, compliance with the different treatment techniques was not measured. There is the possibility that participants found it easier to comply with VFE instead of changing lifestyle behaviors for the VHE
group. The researchers also noted that because the clinicians spent more time with the VFE, they may have inadvertently favored this group, thus causing bias in the results. Fourth, the use of the VHI produced ubiquitous outcomes measures, in which further research should consider using auditory-perceptual, acoustic, and/or physiologic analysis methods to assess treatment effects. Although there were many limitations to this study, results added to the evidence suggesting that VFE might be more effective than VHE.

Roy et al. (2002) conducted a prospective, randomized clinical trial to evaluate the effectiveness of two treatment programs for voice disorders, VHE and voice amplification. Fifty full-time elementary and secondary school teachers with self-reported voice issues were invited to participate in the study. They were then randomly assigned to one of three groups: voice amplification, VHE, or the no-treatment control group. Eleven SLPs volunteered to serve as the voice clinicians, and each went through a 2-hour training session on the study’s purpose and how to properly use the voice amplification device and the VHE program. The ChatterVox portable voice amplification device was used throughout the study. Clinicians met with the participants four times throughout the course of the 6-week study. During the first contact, each participant’s voice was audio-recorded and each was required to fill out a questionnaire on the voice problem, complete the VHI, and complete a voice severity scale. Instruction was conducted immediately following baseline measures. The second and third meetings (2 and 4 weeks post-baseline, respectively) were used to review material that was taught during the first instruction. During the final contact (6 weeks post-baseline) treatment was reviewed and the baseline measurements were repeated. Participants filled out the rating scale and VHI in private in order to minimize clinician
influence. A questionnaire on confidence was administered to the clinicians at the end to assess influence on treatment effectiveness.

Results of this study were analyzed through the combination of both patient-based treatment outcomes and acoustic analysis. Through the comparison of pre- and post-treatment measures of the groups, the voice-disordered teachers that used the portable voice amplification device experienced a decrease in their voice handicap over the 6-week period of the study. Although not statistically significant, the VHE group showed some improvement, as compared to the control group, on all dependent measures. Furthermore, when compared to the control group, the VHE group experienced significantly greater reductions on the VHI (a self-report measure) and noise-harmonic-ratio (an acoustic measure).

One limitation of this study included the didactic nature of the VHE program. Further research should evaluate the variations of procedural aspects of VHE programs, as well as duration variations in influencing treatment outcomes. Second, the nature of the participants’ vocal fold pathology may have accounted for the broad spectrum of variability in the results. Third, the results suggested that voice amplification was better than a vocal hygiene program in reducing vocally abusive behaviors, but the difference was not statistically significant. The combination of a small sample size and small variations in scores did not substantiate the superiority of voice amplification over a VHE program. Last, researchers suggested that future research should explore ways to improve adherence to a VHE program.

Rodriguez-Parra, Adrian, and Casado (2011) conducted a study, using an ABAAA design, to evaluate the effectiveness of two different programs of voice-treatment in dysphonic speakers and the participants’ ability to sustain therapeutic progress for a long-term follow-up period. Forty-two dysphonic individuals were
randomly selected from the Otorhinolaryngology Unit at a local hospital in Spain. Participants were then randomly assigned to one of the two treatment groups. Baseline measures were established using acoustics, spectrographic evaluation, aerodynamic measures, perceptual and videolaryngostroboscopic assessments, and self-rating questionnaires. The first post-treatment measure was conducted immediately after the treatment, then again at 4 weeks, then 12 weeks. The VT sessions consisted of five phases: basic information and counseling, relaxation, breathing, production and placement, and carryover. Participants in the experimental group were instructed to practice the techniques and exercises that were taught in the session, at home twice daily, for 15 minutes. The VHE program, which was adopted from Chan (1994), consisted of an explanation of normal voice mechanisms and laryngeal pathologies, vocal abuse and its consequences, the correct use of voice, and personalized strategies. After 6 weeks, participants had to agree and commit to the changes that were discussed in the session. After the 6 weeks, the participants returned and commented on their ability to carry out the changes and the progress they observed.

Results indicated that there were no short-term differences in scores in the groups’ aerodynamic, acoustic, self-rating scale, videolaryngostroboscopic rating, or perceptual and spectrographic scores. Nevertheless, results showed an improvement for the VT group during the second post-treatment measurement. Through these findings, the researchers concluded that direct treatment was more effective than indirect intervention for voice disorders improvement. It was also noted that from a videolaryngostroboscopic point of view, no participants in the VHE group received a normal diagnosis at the conclusion of the study, whereas almost half of the VT group did.
Pedersen et al. (2003) conducted a prospective, randomized single-blinded pilot study that compared two treatment techniques on patients who had been diagnosed with a non-organic (functional) voice disorder. The two treatments were identified as (1) medical voice hygiene advice and (2) a systematic medical approach. Twenty new patients from an unspecified clinic signed consent forms and were randomized into one of the two treatment groups. One group received treatment that consisted of a medical regime and the other received traditional voice advice, also known as medical voice hygiene advice. The systematic medical approach consisted of direct treatment of micro-organic disorders caused by allergies, infections, reflux or environmental irritants. The medical voice-hygiene advice consisted of a half-hour session on posture correction, abdominal respiration, different intonation patterns, and resonance training. Videolaryngostroboscopy and phonetogram measurements, as well as a quality-of-life questionnaire, were administered at the beginning of treatment and repeated a month later, for both groups. Another random group of participants was referred to as the control group.

Results indicated that participants in both experimental groups admitted that they felt better, in relation to their voices, after one month of treatment. The McNemar test for videostroboscopy showed no changes of the slight abnormalities of the vocal folds of those in the control group. Voice-related quality-of-life scores also improved for both experimental groups, but were not statistically significant. Phonetograms were improved after 1 month for the group treated medically. The voice-hygiene advice group improved their scores of maximum dynamic ranges. The researchers concluded that a combination of medical voice hygiene advice and a scientifically based treatment has possibly a better effect than one of them alone. There is still a need for further evidence in prospective randomized studies.
Leppanen et al. (2009) did a further study based on their previous survey (Ilomaki et al., 2008). They compared the effects of a VHE program to the effects of Voice Massage™ (VM). VM is a Finnish massage method used to treat muscles that affect voice production. Sixty participants were recruited from the previous survey. Participants were around 40 years old and averaged 15 years of teaching experience. They were further randomly assigned to either the VHE group, which only received VHE, or the VM group, which received VHE and VM. The VHE program intervention lasted 3 hours and covered the basics to correct voice use, factors that cause vocal loading in teachers, and ways to prevent this. VM is a special massage technique only performed by a trained VM therapist. It includes ways to manipulate the respiratory, laryngeal, and articulatory muscles without the use of vocalization. Recordings of a 1-minute reading sample and prolongation of a vowel were completed before and after the length of the study, and also at the beginning and end of a workday. Recordings were analyzed acoustically, statistically, and perceptually, and self-perceptual ratings were completed using a visual analogue scale.

Results of this study showed vocal improvements in both the VHE and VM groups, but a greater change was found in the VM group. The mean (F₀) and the changes within the mean (Leq) of fundamental frequency and equivalent sound level did not correlate with self-reports. The researchers stated that this could suggest that, in experienced voice professionals, the type of voice production (reflected in these acoustic variables) is not so clearly related to symptoms of vocal fatigue. It was suggested that other factors, such as the amount of voice use and the amount of vocal rest per day, can affect the prevalence of symptoms of vocal fatigue. The VHE group reported increased tiredness in the throat and difficulty phonating, while the VM group had the opposite. There was a positive
increase in both groups for vocal function, although the increase for VM was much higher. The VM group reported increased relaxation and having more self-awareness of their body and vocal endurance. The dramatic increase for the VM group could be associated with the extent of attention that was given to them by the therapists, which helped them to build a positive interactive environment. In general, through evaluations of the interventions, there was no correlation between the workday-related changes and the self-reports.

Pasa et al. (2007) conducted a pilot study to investigate the difference in effectiveness of a VHE program as compared to the use of VFE in to reduce vocal symptoms and vocal misuse behaviors, and to increase voice care knowledge, maximum phonation time, and maximum phonation frequency rates in school teachers. Schools were selected based on convenience in the metropolitan area of Melbourne, Australia, in which 37 primary school teachers volunteered to participate from three different schools. Inclusion criteria consisted of being a full-time teacher and having at least 1-year prior experience. Participants were excluded if they were smokers or consulted with a speech pathologist or otolaryngologist in the past 2 years. The researchers used a multi-group pretest-posttest design, which randomly placed the participants in one of the three groups: VFE, VHE, or no-treatment control group.

Pre-test measurements of all participants in the study were conducted, which included maximum phonation frequency range and maximum phonation time measures. The researchers met with the experimental groups (VFE and VHE) four times and the control group three times during the course of the study. During the first contact, the experimental groups also completed a questionnaire on voice knowledge, vocal capabilities, and vocal symptoms. They then attended their VHE or VFE session. The second session, conducted after three weeks, consisted of a
discussion of what they had learned in the prior session and feedback about any questions they had at that point. The third contact, 6 weeks later, consisted of a review of information from the prior sessions and data collection on their progress. The last contact, 10 weeks later, consisted of another assessment and questionnaire. The control group also met during the 1st, 6th, and 10th weeks, and completed the same questionnaires and voice assessments, but received no training. The VFE consisted of four exercises (warm-up, stretching, contracting, and adductory strengthening exercises) to be practiced twice through, twice a day, during the 6-week period of the study. The VHE sessions included discussions on (1) the prevalence and impact of voice problems in teachers, (2) the basic anatomy and physiology of voice production, (3) symptoms of voice disorders, (4) causes of voice disorders, (5) strategies to reduce harmful vocal behaviors, (6) managing and minimizing health factors that contribute to the development and maintenance of voice problems, and (7) changes to the speaking environment that increase vocal efficiency and reduce vocal harm (Pasa et al., 2007).

The results of this study demonstrated that of the two training programs, VHE was more effective than VFE in improving knowledge of voice care principles and decreasing vocal misuse behaviors for primary school teachers. It also demonstrated that those who did not receive any training experienced an increase in vocal symptoms and a decrease in maximum phonation time. Although the VFE group gained some knowledge on vocal hygiene, it did not compare to the results of the VHE group. Misuse behaviors increased from pre- to post-test intervention for the VHE group but decreased again during the follow-up measurement. Both the VFE and VHE group reported a decrease in vocal symptoms over time, which could be associated with their ability to detect harmful behaviors. The VFE did not perform as anticipated on the voice task analysis,
possibly due to the limited amount of training they received or the participants’
lack of compliance to practice. Overall, the results of this study support the use of
a vocal hygiene seminar in reducing vocally abusive behaviors. The researchers
suggested further research to include a larger sample group, other measures of
voice, and alternative methods to track adherence by the participants.

To summarize, these research studies have added information on how VHE
compares to another form of voice treatment. Although these findings are not
consistent, they are important considerations for future voice therapy. A few
studies showed that a direct form of voice therapy produced more desired voice
treatment results than a VHE program (Behrman et al., 2008; Duffy & Hazlett,
2003; Leppanen et al., 2009; Rodriguez-Parra et al., 2011; Roy et al., 2001, 2002),
whereas another study showed that VHE was more effective than VFE in
improving knowledge of voice care principles and decreasing vocal misuse
behaviors (Pasa et al., 2007).

**Treatment Combining Vocal Hygiene with Other Treatments**

Clinicians who use voice treatment often seek to find the most effective
means for helping their clients. Many studies have been conducted on the
combination of different techniques. These studies were conducted to combine
both indirect and direct forms of voice treatment. Direct forms of treatment
include VFEs, VPT, or medical intervention. Different variations of VHE were
used as the indirect form of voice treatment. Although they all provided some
form of information on proper functioning of the vocal mechanism, the
information content varied somewhat. Also, the program was taught by individuals
with differing levels of education, and the modalities used to present the
information were different.
Gillivan-Murphy et al. (2005) conducted a study to test the effectiveness of a 6-week combined treatment approach on reducing the effects of vocal abuse on 20 teachers who had self-reported voice problems. The two treatment approaches included VFE and VHE. Participants were recruited through the use of advertisements and notices placed in publications for teachers. Inclusion criteria consisted of being a full-time primary or secondary school teacher and having a self-reported voice/throat symptom. Exclusion criteria included being a smoker, having a neurological disease, diagnosis of a laryngeal pathology requiring medical intervention, being under the care of a laryngologist for a voice disorder, and participating in voice therapy within the past year. Twenty teachers were selected to participate in the study and were randomly assigned into either of the two groups (treatment and non-treatment) using a block design. Both the control and treatment groups went through voice measurements to form pre-test measures before beginning the study and again two weeks after the study was completed. Three self-reported voice measures were administered. These included: The Voice-Related Quality of Life, which assesses the impact of the voice problem on quality of life; the Voice Care Knowledge Visual Analogue Scale, which assesses the subject’s current knowledge and confidence in voice care, voice production, and voice exercises; and the Voice Symptom Severity Scale, which is a patient-derived inventory of voice symptoms. These measurements were re-administered 8 weeks after the initial baseline assessment. The no-treatment control group received no intervention during the 8-week period, whereas the treatment group received five to six direct individual treatment sessions weekly, each lasting 50-60 minutes. Each session for the treatment group taught different VFEs, which were supplemented with a written program of the exercises, along with audio recordings for practice. The VHE aspect of the program was incorporated through providing
the participants written information, along with time for clarifications on what was given to them. It was noted that most of the treatment session was focused on the VFEs.

Overall, it was shown that a combination of treatment approaches involving VFEs and VHE significantly improved self-reported voice symptoms and voice care knowledge. Some discrepancies were noted throughout the scoring between the two groups on the three voice measurement tests. First, although the control group at baseline rated themselves higher in three out of five voice care knowledge areas, they showed more voice difficulties. Second, because participants in the treatment group began the study with fewer symptoms, they had less room for improvement at the end of the study. Third, the control group showed improvement in the total Voice-Related Quality of Life scores, which was not expected for the control, but could possibly have been due to them feeling better about their voice problems. As for the Voice Symptom Severity Scale scores, the control group had minimum change, which was expected, but the treatment group had a reduction in scores, although not enough for statistical significance. For the voice care knowledge aspect of the study, the treatment group had the largest amount of change, affirming the vocal exercise component in the treatment group. Another unexpected change was in the control group indicating an improved knowledge in voice production, although they had not received any specific information regarding voice production.

Nanjundeswaran et al. (2012) conducted a prospective, randomized, controlled study to assess the effects of a VHE program compared to a VHE plus a voice-training (VT) program (VHE+VT) for the prevention and treatment of voice problems in student teachers. For this prospective study, VHI scores were gathered from the participants before and after treatment interventions. Satisfaction
questionnaires were also distributed and were included in the outcome measures. Baseline VHI scores were collected through phone calls to participants who signed up. Participants were then randomly assigned to one of the three groups: VHE, VHE+VT, or no-intervention control group. VHI measurements were re-administered to all participants four weeks following the initial intervention.

Participants in both intervention groups (VHE and VHE+VT) attended a 2-hour group education seminar on VHE. Voice care instructions consisted of information on (1) hydration, (2) exogenous inflammation control, and (3) abstinence from patent yelling and screaming. These factors of voice care were selected because the researchers believed in a minimalist approach to improved compliance by participants. After the completion of the seminar, participants met with the clinician personally and tailored the VHE to themselves, which lasted about 10-15 minutes each. An internet-based training was also provided to each participant to complete during the following four weeks. Following each online training, participants rated their voices. The VT program was adapted from Lessac-Madsen Resonant Voice Therapy, in which the “biomechanical target in VT involves a barely ad/abducted laryngeal configuration that optimizes the relation between output intensity (large) and vocal fold impact intensity (small), an ideal target for individuals who use their voices heavily professionally, such as teachers” (Nanjundeswaran et al., 2012, p. 816.). This was completed using a group format that lasted approximately 4 hours. During the session, participants were able to practice and demonstrate their use of techniques with clinician guidance. After completing the VT, they received voice exercises and a VHE questionnaire to complete twice weekly on random days. A prerecorded audio file of the exercises was sent to each participant, and exercises were required to be
practiced and recorded at home. Participants were instructed to return recordings of the completed exercises to the presenters within 24 hours, online.

Results of this preliminary study showed that, for individuals with low VHI scores (meaning a healthy voice), VHE was sufficient to prevent worsening of voice quality. The introduction of the VT did not strongly or consistently enhance VHI scores. In contrast, individuals with higher VHI scores at the start of the study showed some improvement through the VHE program, but scores improved more dramatically with the addition of the VT program. The researchers identified several issues that should be considered when reviewing these results. First, the researchers used what they described as a minimalist VHE program as compared to more comprehensive VHE programs that were used in previous studies. Second, subject attrition occurred in almost all the clinical trials, which could have potentially affected the data. Lastly, results from this study should be interpreted carefully because changes in vocal status were based on VHI scores, and not laryngeal evaluations.

Bovo et al. (2007) conducted a randomized, controlled, longitudinal study to assess the effectiveness of a VHE course in a homogenous group of female teachers. Between the years of 1999 and 2004, 264 teachers participated in a vocal care course. Once participants were selected, pre-test measures were completed, to include videolaryngostroboscopy, a perceptual evaluation, an acoustic analysis, and a self-reported voice evaluation. Participants were then randomly placed in either the experimental or control group. The experimental group received theoretical lectures, practical workshops, VHE workshops, lessons on habit registration, and strategies to reduce vocal demand in the classroom. Post-test measures were repeated 3 months after the pre-test measures. The experimental
group also completed a questionnaire on the benefits from the course at the end of the study.

Results of this study indicated that the teachers who followed the program of vocal hygiene and voice exercises at home did not show significant changes through the videolaryngostroboscopy evaluation. Changes were indeed in the right direction, but did not meet statistical significance when compared to the control group. This could have been because the stroboscopical parameters that were considered, were seldom present. When videolaryngostroboscopy results were compared to the questionnaire, 85% of teachers reported they had practiced good vocal hygiene and 90% had adopted techniques in the classroom. The researchers presumed that the theoretical lecture increased the awareness of the following aspects: (1) warning symptoms of vocal fatigue, (2) reductions of volitional use of voice, (3) use of specific strategies to maintain classroom order without abusing the voice, (4) contributing factors, and (5) knowledge of personal vocal limits. Thus, because the investigators sought to find a cost-effective voice treatment, the theoretical lectures were effective (but not statistically significant) and relatively low cost. Results of this study added to the research base on the positive effects of a VHE course combined with VFEs.

Pizolato et al. (2013) conducted a study to investigate the effectiveness of a voice education program that includes VFE and VHE in teachers. Teachers from the public-school network in the municipality of Piracicaba, São Paulo were randomly selected and placed in either the experimental or control group. Inclusion criteria consisted of being a nonsmoker, not having a history of surgery or diagnosis of organic disease of the larynx, not being enrolled in speech therapy during the educational program, and not being over the age of 55. Before beginning the study, both groups performed a vocal evaluation, that consisted of
an emission of the vowel /i/. Acoustic analysis was performed and included analysis of voice quality, or harmonics-to-noise ratio. The experimental group then participated in a VHE program that included one session on vocal hygiene and four sessions on VFEs. The sessions lasted 30 minutes and were scheduled 15 days apart. The vocal hygiene program consisted of teaching participants about how the voice is produced, pathologies that can occur, and strategies on how to get students’ attention without harming the voice. The VFE sessions covered topics on posture and cervical relaxation, respiration, phonation, frequency, intensity, resonance, and articulation. After the completion of the program, both groups repeated the same vocal evaluation administered at the beginning of the program.

Results of this study suggested that a VHE program that includes VFE and vocal hygiene can improve voice quality in teachers. Changes were detected in the evaluation of the voice before and after training session exercises: cervical relaxation and good posture and phonation, frequency, and intensity. Male participants’ vocal quality improved more than females, after relaxation and good posture training. Results also indicated that there were no significant changes in acoustic parameters for respiration exercises, and resonance and articulation exercises. An important finding to point out is that although vocal intensity improved in participants, the parameters still continued to be above the normal range. Because of this, the researchers indicated that it is important that teachers receive ongoing training in order to continue to balance their pitch. Overall, the training exercises, specifically for the voice, presented a positive impact on the acoustic variables after the exercises were performed, but this impact was not possible to see prospectively. It was suggested that to see lasting effects, the vocal exercises should be performed on a continuous basis.
Fu et al. (2014) conducted a study using a pragmatic, randomized clinical trial, to investigate the effectiveness of intensive voice treatment (IVT) compared with traditional voice treatment (TVT). The investigators looked at the perceptual, physiological, acoustic, and aerodynamic outcomes of patients with vocal nodules. Fifty-three female participants were recruited from the Department of Otorhinolaryngology, Taipei, and Veterans General Hospital, Taiwan. Inclusion criteria consisted of: being between the ages of 18 and 55; having normal articulation, resonance, language, and hearing; not having any previous professional singing/speaking training; and not having previous voice therapy or laryngeal surgical treatment. Exclusion criteria eliminated potential participants who used prescription medications that may change laryngeal function, had a current psychiatric or neurologic condition, or had a history of allergies, lung disease, or other vocal pathology. Before the study began, participants were paired and further assigned based on their occupation, age, availability, and severity of dysphonia. Due to attrition, the final study consisted of 24 participants in the IVT group, and 29 participants in the TVT group. Comparison of baseline measures indicated that there were no differences in parameter scores between the two groups, which included location of nodule or surrounding edema. Participants were assessed three times throughout the study by a clinician blind to the study: before treatment, 3 weeks after vocal hygiene sessions, and immediately following IVT or TVT.

Auditory perceptual ratings were conducted by an experienced SLP. The Grade, Roughness, Breathiness, Asthenia, Strain Scale was used to assess vocal quality. Physiological ratings were completed through a videolaryngostroboscopic evaluation, which rated the vocal folds symmetry of closure, regularity, amplitude, and smoothness. A questionnaire, adapted from Holmberg, Hillman, Hammarberg,
Södersten, and Doyle (2001), was also used to compare results before and after treatments, as well as between groups. Aerodynamic assessment included measurements in mean airflow rate, maximum phonation time, and subglottic pressure. Acoustic assessment included sustained production of /a/, which was further analyzed using the Multi-Dimensional Voice Program.

The therapy program was identical in each group. The only difference was the intensity of the delivery for the direct voice therapy. Both groups received a general vocal hygiene course, and then attended eight sessions of direct voice therapy. The TVT group attended one session per week for 8 weeks, whereas the IVT group attended the same eight sessions, but within a 3-week period. The voice therapy was adapted from the Lessac-Madsen Resonant Voice Therapy (Verdolini, 1998), as well as VFEs.

Results of this study indicated a positive change in perceptual, physiological, and acoustic measures in the IVT as compared to the TVT group. Although both groups demonstrated benefits across multiple variables, more intensive practice may be more effective and better for some patients. Post-vocal hygiene scores indicated a positive difference in perception of reduced strain for the TVT group, but no other significant differences were noted in the other categories. In contrast, physiological assessment indicated significant differences in the mucosal wave, vocal fold smoothness, and glottal closure following the vocal hygiene program in both groups. Verdolini-Marston, Sandage, and Titze (1992) also noted this discrepancy. Although there were significant changes in perceptual and physiological parameters post-IVT, the results were comparable to results post-TVT. Lastly, these findings suggest that a vocal hygiene program is important to include as a component of a comprehensive vocal rehabilitation program, because topics included in a vocal hygiene program may be responsible
for eliminating the behaviors that contributed to the development of the vocal pathology in the first place.

Ilomaki et al. (2008) studied the effects of VT and a VHE program. Sixty female teachers were randomly assigned as participants, and then further assigned to either the VHE group (30 participants), which only received the lecture, and the VT group (30 participants), which received the lecture and voice training. Participants recorded a pre-specified read text, an individual vowel prolongation, and answered a quick questionnaire through the use of a visual analogue scale, at the beginning and end of every workday. After the participants completed the pre-intervention recordings, they attended a 3-hour VHE lecture. The lecture covered basic knowledge of voice production, causes to voice loading in teachers, prevention tools, and the basics to economic and noneconomic voice use. The VT group attended five sessions over the course of 9 weeks after the VHE lecture. The objectives of these training sessions were to gain ease and endurance in voice production and to eliminate vocal abuse behaviors. The test readings and vowel prolongations were acoustically and perceptually analyzed. Statistical analysis was then performed on the results reported by the participants between the workdays.

Results of this study showed that the VT group showed change in perturbation (less jitter), a decrease in self-reported difficulty when phonating and throat tiredness, and better perceptual voice quality. In contrast, the participants who only attended the VHE lecture, had an increase in throat tiredness and more difficulty in phonating, but no change in voice quality. There were some inconsistent results reported through the VT group, where the perceptual evaluations showed improvement in voice quality, but the self-reports only indicated a slight increase in improved voice quality. The researchers suggested that this inconsistency may indicate that the learning process may cause a feeling
of non-competency in the participants, which may have a positive consequence to push the participants. The further hypothesized that this may have a positive consequence in pushing the participants to learn more. The authors suggested that future studies should determine the impact of the two intervention methods on the different learning styles of participants. Although participants in the VHE group did not show as high of an increase in scores, they still indicated that they were able to learn certain methods just from the lecture. It was also indicated that future research should focus on constancy of results, whereas this study had multiple confounding scores and results.

Hackworth (2007) studied the effects of vocal hygiene and behavior modification through self-reported scores of music teachers. In this study, 76 participants were randomly placed in treatment group 1, treatment group 2, or the control group. Participants were recruited through their responses to a letter invitation. Participants had to indicate whether they were a general or vocal music teacher. All participants were given a pre-project questionnaire reporting on general vocal health, past or present vocal problems, and demographic information. The first experimental group, which included 19 participants, attended a VHE seminar. Experimental group 2, which included 11 participants, received VHE and also attended a session on behavior modification techniques. These treatment sessions were conducted at week 3 of the 8-week period of the study. The control group, which included 46 participants, attended a brief 1-hour version of the VHE seminar. Pre- and post- VHE scores were collected from the control group to determine the amount of knowledge gained in the session. Participants in each group completed a daily (Monday-Friday) checklist that included noting on “water consumption, minutes of daily vocal warm-up, number of vocal breaks taken (complete voice rest), and whether teachers talked over
noise and/or used non-verbal commands during the day” (Hackworth, 2007, p. 3). The daily checklist also required the participants to note on reported vocal problems each day. Self-reported scores were selected for this study in order to avoid classroom disruption and to make data collection more feasible for this large group.

Results of this study showed that participants in the experimental groups scored significantly higher on the VHE sessions post-test as compared to the pre-test. This indicated that the instruction improved immediate knowledge on basic vocal hygiene, even if it did not have a lasting effect. This could possibly be due to the fact that the participants were able to better comprehend the information that was presented to them after the instruction, as compared to the pre-test score. Through further analysis, the researchers determined that one session of vocal hygiene is not sufficient to create long-term effects. Statistical testing performed at weeks 2 and 4 revealed that experimental group 2 had significantly higher scores in the increased number of vocal breaks taken and decreased number of vocal problems reported. This indicated that treatment had beneficial short-term effects on self-reported behaviors. In addition, participant ratings of the effectiveness of the VHE session indicated positive comments stating that the session was enjoyable and beneficial. Experimental group 2 indicated an increase in the number of vocal breaks taken and a decrease in the number of vocal problems reported. These findings indicated that the treatment had a significant effect on self-reported behaviors.

Timmermans et al. (2005) conducted a study to analyze and evaluate the effectiveness of a VT program, which included a combination of VHE and IVT. Twenty-three participants, aged between 18 and 30 years, were recruited and received 18 months of VT. The VHE portion was conducted during the first 9
months of the study and consisted of education on basic anatomy and physiology of vocalizations, vocal hygiene, and rules on correct productions, which added up to a total of 30 hours. The second half consisted of the VT, which included IVT techniques, and added up to 30 hours. Data collection was based on a multi-dimensional voice assessment that was first carried out in the beginning of the study, 8 months after, and again 11 months after the completion of the study. Data were collected from each subject on perceptual evaluations, acoustic parameters, aerodynamic parameters, and self-evaluation.

The result of this study indicated that through the use of a VHE course in combination with VT, VHI scores improved slightly, but did not reach statistical significance. The researchers indicated that this was possibly due to the low motivation from the participants because of their age. Although results were not significant, it was concluded that a well-organized VT program can improve voice quality in future voice users. It was also noted that vocal hygiene instruction did not produce as significant results, and that future research should formulate a way to better change vocally abusive behaviors in daily life.

Through these studies, it was shown that VHE combined with a direct form of voice treatment, can significantly improve self-reported voice symptoms and voice care knowledge (Bovo et al., 2007; Fu et al., 2014; Gillivan-Murphy et al., 2005; Hackworth, 2007; Ilomaki et al., 2008; Pizolato et al., 2013; & Timmermans et al., 2005). It was also found that VHE alone may be sufficient enough for patients with a low VHI score, and that VHE should be used in conjunction with another form of voice therapy if an individual’s VHI score is higher (Nanjundeswaran et al., 2012).
Vocal Performers

Each profession demands a certain amount of vocal load as compared to others. Compared to the average voice user, vocal performers demand more from their voice with respect to articulation, breathing, and phonation (Braun-Janzen & Zeine, 2008). Many might assume that, as professional voice users, they would gain more knowledge on the anatomy and physiology and care of the vocal mechanism than other professions. This is not always the case for these individuals.

D’haeseleer et al. (2016) conducted an observational cohort study on musical theater performers. These individuals relied on their voice quality and capacity as they combined singing, acting, and physical performance. The purpose of this study was to determine the voice quality of 31 students over the course of a year. Students were included if they were in their first or second year of the musical program and were in good physical and mental states. Pre-test measures were conducted at the beginning of the study, which included subjective measurements (videolaryngostroboscopy, perceptual evaluation of the voice, VHI, and a questionnaire investigating voice symptoms and risk factors) and objective measurements (aerodynamic measures, vocal range, acoustic analysis, and DSI). Only seven students were reevaluated a year later with the same measurements.

Results of this study indicated that although participants reported having good vocal capacities (through DSI scores), the median scores for VHI scales were less than 20, which is below the clinical score. The questionnaires revealed that voice symptoms and vocal behaviors were present in this population, indicating “vocal fatigue, dryness of the throat, vocal tract discomfort, and harmful vocal habits in the majority of students” (D’haeseleer et al., 2016, p. 468). The follow-up assessment indicated that there was no change in the vocal quality and vocal folds’
status as they went through their course work of a year. At the beginning of the study, the researchers hypothesized that student’s scores would increase throughout the year, because they would gain more knowledge about how to properly take care of their voice, which was not the case in this study. Result of this study emphasized the need for these students to go through a medical voice screening regularly throughout their program.

Barnes-Burroughs and Rodriguez (2011) conducted a study, using an anonymous online survey, to investigate the voice hygiene and voice use practices of teaching performers in and out of performance periods, and to assess their readiness to consider hygienic vocal changes as a routine. Teaching performers were described as being singing voice teachers, but who are also active performers. In total, 596 scores from participants were analyzed descriptively and comparatively. Questions regarding vocal loading, teaching and performing practices, voice use adjustment methods, assessment, and background were included.

Results of this study indicated that these teaching performers tended to reserve their voice during teaching, and more so during performances. Participants indicated that voice use, hydration, sleep, diet, exercise, and stress are important, but paid more attention to vocal hygiene and health during performances. It was concluded that teaching performers may adopt beneficial habits provided to them to attain a higher degree of satisfaction with their own abilities. Results indicated that there is still a need for further research in the area of vocal health, vocal hygiene, and vocal dosing.

Braun-Janzen and Zeine (2008) conducted a survey study to evaluate the interest and knowledge of vocal function and dysfunction in singers, who did not teach. Six singing groups (two amateur groups and four professional groups) were
recruited and provided with a questionnaire, used to compare the groups. The questionnaire included questions on vocal anatomy and physiology, vocal disorders, and treatment techniques for voice disorders. The questionnaire was distributed and collected in multiple ways, depending on the group’s preference.

Results of this study showed that both professionals and amateurs indicated they were either moderately or very interested in expanding their knowledge in all areas. The areas consisted of: anatomy and physiology of the voice, care of the voice, optimal use of the speaking voice, functional vocal disorders, and the role of the SLP in regards to voice. Participants’ overall knowledge levels were scattered for each category. Participants reported a basic or thorough understanding in the areas of anatomy and physiology, care of the vocal mechanism, functional vocal disorders, and role of the SLP in regard to the voice. Between the two groups (amateur and professional), both showed at least a moderate interest in expanding their knowledge of vocal function and dysfunction. Results showed that the highest level of interest included care of the voice (94%) and optimal use of the speaking voice (90%), which revealed congruence in the concern both groups on maintaining a healthy vocal mechanism. Although both groups reported high levels of interest, the professional singers indicated significantly higher interest levels, suggesting they may be more receptive to an education approach to voice therapy.

This literature review revealed several interesting findings. Several of the studies concluded that VHE programs are effective in reducing self-evaluated perceptions of the impact of vocal difficulties, indicated by a drop in VHI scores (Duan et al., 2010; Faham et al., 2015; Mathur et al., 2015; Pasa et al., 2007), as well as improved stability of voice quality (Yun et al., 2007). Other studies concluded that VHE programs were not effective in decreasing vocally abusive
behaviors, but served as a positive experience for participants (Broaddus-Lawrence et al., 2000). When VHE was compared to other voice treatment strategies, a more direct treatment approach resulted in better voice outcomes than a VHE program alone, although there was some improvement for those who received VHE (Behrman et al., 2008; Duffy & Hazlett, 2003; Leppanen et al., 2009; Rodriguez-Parra et al., 2011; Roy et al., 2001, 2002). Further research evaluated the effect of combining direct approaches with VHE, which resulted in a significant improvement of voice symptoms and voice care knowledge (Bovo et al., 2007; Fu et al., 2014; Gillivan-Murphy et al., 2005; Hackworth, 2007; Ilomaki et al., 2008; Pizolato et al., 2013; Timmermans et al., 2005). The current study focused on vocal performers due to the lack of research regarding VHE with this population, and due to their presumed high interest levels for learning more about vocal hygiene (Braun-Janzen & Zeine, 2008). Expanding upon the information gathered from previous pilot studies conducted at CSUF (Pomaville & Radford, 2013, 2014), the current study included participants who are vocal performers in the Fresno community.
CHAPTER 3: METHODOLOGY

Research Design

The present study was conducted to assess the effectiveness of a VHE program on increasing vocal knowledge and on decreasing the frequency of at-risk vocal behaviors in vocal performers. A quasi-experimental, single-group, pretest-posttest research design was utilized. Several previous studies have utilized a quasi-experimental, pretest-posttest group research design to investigate the effectiveness of participating in a VHE program (Achey et al., 2016; Bolbol et al., 2016; Chan, 1994; Duan et al., 2010; Faham et al., 2015; Mathur et al., 2015; Scrimgeour & Meyer, 2002; Yun et al., 2007). The independent variable for this study was participation in the VHE program. The dependent variables were the participants’ self-reported behavioral changes and the amount of retained knowledge, as indicated by their responses on an online survey. Data were statistically analyzed to evaluate the significance of any reported changes when comparing pre-and post-test survey responses.

Participants

Results of this study are based on complete participation of 20 individuals, meaning that 20 individuals completed both the pre-and post-seminar questionnaires and participated in the VHE seminar. Participants included 4 males and 16 females. Initially, data for 31 participants were gathered, but attrition and improper completion of either of the questionnaires precluded 11 participants from the data analysis.

Participants in this study were vocal performers. Vocal performers were defined as individuals involved in the performing arts (drama or singing) and included both students and other members of the community at large. In addition,
the following participant criteria were established: (1) they had to be 18 years or older; (2) they had to speak and understand English; and (3) they could not be enrolled in speech therapy for any reason.

**Setting**

The VHE seminar was conducted in the Professional Human Services Building, room 217, also known as the “voice lab,” at Fresno State. This room was equipped with 20 desks, a large white board, and a smart TV. Each seminar that was conducted had fewer than 8 participants.

**Participant Selection and Informed Consent**

Brief class presentations were conducted in various classes in the Music Department at Fresno State. These presentations provided an opportunity for the researcher to introduce the study, answer questions, and gather contact information from those interested in participating or receiving more information about the study. A recruitment flyer (Appendix A), which included a brief description of the study and the student researcher’s contact information, was distributed during these presentations and posted on various bulletin boards throughout the Music Department hallways and performance venues at Fresno State. In addition, the recruitment flyer was sent electronically to instructors in the Music Department at Fresno Community College with a request that they be distributed to potential participants.

Potential participants who contacted the student researcher were given the opportunity to ask questions, and the researcher confirmed that they met the participant criteria at that time. If the potential participant was still interested, he or she was provided with the dates and times for the scheduled VHE seminars. The VHE seminars were scheduled on six dates and times so that interested
volunteers would have the opportunity to select a date and time that was most convenient for them.

Once the potential participant was scheduled for one of the VHE seminars, he or she was sent a randomly selected identification number and the link to an online survey site called Qualtrics. The first step to the online survey process was completion of the informed consent form. The consent form consisted of the background and purpose of the study, the procedures, risks/discomforts of being in this study, benefits, confidentiality, the opportunity to withdraw, and the participants’ right to ask questions and report concerns (Appendix B). Once informed consent was obtained, the pre-test survey began.

Participant anonymity was established and maintained by assigning each participant a randomly generated identification number. This number was used as identification for their survey responses and for all data analysis from that point forward. A master list of participant names and identification numbers was created and locked in the primary researcher’s office for the duration of the study.

**Pre- and Post-Test Survey**

Data were gathered through the administration of an online survey containing questions regarding participants’ knowledge of vocal production and asking participants to self-report at risk vocal behaviors (Appendices C and D). Knowledge-based questions were presented in multiple choice, matching, and open-ended response formats. These questions were included to assess the participant’s knowledge of the vocal mechanism. The behavior inventory was presented in either a Likert scale format or the option to choose from multiple responses. This survey was administered for both the pre- and post-test. The online pre-test survey was completed prior to attending the VHE seminar. The post-test
survey was administered to the participants 3 weeks after the seminar they attended. Participants had up to 4 weeks to fill out the questionnaire and were emailed reminders throughout that time.

As discussed in the literature review, the findings from two previously conducted pilot studies (Pomaville & Radford, 2013, 2014) became the inspiration behind the current study. The original questionnaires used by Pomaville and Radford (2013, 2014) were developed by an interdisciplinary team including a speech-language pathologist in the CSDS Department at CSUF, and two Music Professors, one at CSUF and one at FCC. This questionnaire was refined over the course of the two pilot studies. Questions were modified, as needed, for better comprehension and to make sure the researchers were gathering the information that was needed. For the purpose of this current study, the following additional modifications were made to the survey. First, rather than relying on the participants’ self-reported increase in knowledge and understanding of the information presented, the students were asked to answer a series of objective questions designed to test their understanding of the information that was presented. Second, the questions designed to identify changes in at-risk vocal behaviors were adjusted to a Likert-type scale in an attempt to capture degrees of change, as well as to facilitate analysis of the data gathered. Finally, rather than administering it one time, as was done in the pilot studies, the survey was administered in an on-line format both before and after participation in the VHE program, thus providing a pre-test and post-test measure.

**Vocal Hygiene Education Program**

The VHE program consisted of a 2-hour lecture and discussion covering the following topics: (1) anatomy and physiology of the larynx, (2) the
identification and elimination of at-risk vocal abuse and misuse behaviors, (3) symptoms of laryngeal problems, (4) hydration, (5) healthy practices for vocal performers, (6) laryngopharyngeal reflux (LPR), and (7) other etiologies related to voice problems (see Appendix D for a detailed outline of the VHE program content). The information was presented by the student researcher using a PowerPoint presentation and smart television. This PowerPoint was also used to create written handouts that were provided to the participants. In addition, several videos were reviewed showing healthy larynges and a variety of vocal pathologies. Throughout the VHE program, there were opportunities for student questions and discussion of the topics being presented.

Reliability

Many of the questions on the survey were objective in nature and consisted of multiple choice or matching responses. The accuracy of these responses was determined by comparing the survey to a written answer key. The remaining questions consisted of open-ended questions and Likert scale options. For the open-ended questions, interjudge reliability was determined by having a second rater independently score the responses. A point-by-point analysis was completed by comparing the student researcher’s scores to a second rater who was a licensed SLP. The percent agreement was calculated by dividing the number of agreed upon responses by the total number of response opportunities.

Data Analysis

Data analysis was based on the comparison of the participants’ pre- and post-seminar responses. The information gathered was used to determine whether the participants (1) retained significant information regarding voice production
and protection, and (2) changed at risk vocal behaviors (see Appendices C and D for survey content).

Knowledge-based questions. These questions consisted of multiple-choice (questions 1-10), matching (questions 13-20), and open-ended responses (questions 21-25). Question values varied from 1 to 5 points, depending on the number of responses required for each question. Each correct response was awarded 1 point. A maximum of 1 point was awarded for questions 1-3, 7-10, 13-20, 22, and 25. A maximum of 3 points was possible for questions 4-5 and 21, 4 points for questions 6 and 23, and 5 points for question 24. All participant responses were scored based on earning one point per correct response, resulting in a total point score for those questions for the group. The points awarded for all participants were combined for a group total, then averaged. This was done for both pre-test and post-test scores, resulting in a mean score for positive pre-test perceptions and a mean score for positive post-test perceptions. These mean scores were then compared to determine whether there was a significant degree of change using a paired sample t-test.

Self-analysis of voice. Questions 11 and 12 asked participants to select from a list of statements based on which statements they felt best represented their perceptions of their voices during speaking (question 11) and singing (question 12). The first three statements for each question represented positive perceptions, while the rest of the statements represented negative perceptions of their voices. The purpose for these questions was to determine if participation in the VHE program resulted in significant increase or decrease in the participants’ self-perceptions of their voices. One point was awarded for each of the positive perception statements selected. The points awarded for all participants were
combined for a group total, and then averaged. This was done for both pre-test and post-test scores, resulting in a mean score for positive pre-test perceptions and a mean score for positive post-test perceptions. These mean scores were then compared to determine whether there was a significant degree of change using a paired sample t-test. The same procedure was used for the scoring and analysis of the negative perception statements.

Behavior-based questions. The behavior-based questions consisted of two types of data that were gathered and analyzed. The first portion consisted of a behavioral inventory that was made up of questions 26 through 34. Qualitative analysis was used to note any changes in behaviors that may have resulted from the participant’s attendance in the VHE program. Positive, negative, and static behaviors were charted and analyzed based on pre- and post-test responses. Question 26 required participants to indicate how much water they typically drank per day. Anything that was 2 liters and over was considered positive, and all other responses were negative. Question 27 required participants to indicate how much caffeine they drank per day. Anything between none to 1 to 2 cups was considered positive, and all else was negative. Question 28 required participants to indicate their alcohol intake. Anything between none to 1 to 2 drinks per week was considered positive, and all others were considered negative. Questions 29 through 34 charted the number of participants who smoked, vaped, and were diagnosed with reflux. These results were analyzed qualitatively to determine whether specific behaviors increased, decreased, or stayed the same, and whether these changes represented a positive or negative change in the frequency of both positive and negative vocal behaviors.
The second portion of the behavior-based questions consisted of questions 35, 36, and 37 (a, b, c, i). Responses to these questions were grouped together for analysis because they represented participant behaviors and the frequency at which they occur. Response option 36 (n) was taken out prior to any data analysis being completed because it was unclear whether it would constitute a positive or negative behavior. Question 37 (d-h) was analyzed separately because it represented the frequency at which vocal symptoms occur rather than actual participant behaviors. These responses are discussed in the next section.

For questions 35, 36, and 37 (a, b, c, i), a 5-point Likert scale was used, and each subsection required the participants to rate how often they reacted using a particular positive behavior. Points were evenly distributed based on the following responses: (all the time) 5 points, (most of the time) 4 points, (occasionally) 3 points, (rarely) 2 points, and (never) 1 point. Questions 35 (a) and 37 (a, b, c, i) asked participants to rate how often they reacted using a particular negative behavior. Because these responses represented negative behaviors, they were reverse scored for the purposes of data analysis, which means that the distributed points on the Likert scale were flipped. In doing so, any change in score would now represent a positive behavioral change. In other words, the frequency with which their reaction represented a positive behavior increased, or the frequency with which their reaction represented a negative behavior decreased. The Likert-scale points for these questions were added together again to calculate a pre-test group total and a post-test group total. Then, these totals were used to calculate pre- and post-test mean scores, which were analyzed using a comparative paired sample t-test.
Symptom-based questions. This portion of the survey consisted of question 37 (d-h), which assessed how often certain vocal symptoms occurred. Each subsection required participants to rate on a 5-point Likert scale how often they experienced each symptom. Points were distributed based on the participants’ responses. *More than twice a day* received 5 points, *1 to 2 times per day* received 4 points, *1 to 5 times a week* received 3 points, *less than once a week* received 2 points, and *never* received 1 point. The Likert-scale points for these questions were added together again to calculate a pre-test group total and a post-test group total. Then, these totals were used to calculate pre- and post-test mean scores, which were analyzed using a comparative paired sample t-test.
CHAPTER 4: RESULTS

Data collection involved administration of an online survey, which was used as the pre-test and the post-test for this study (see Appendix C for the online survey). The purpose of the survey was two-fold. Questions were designed to (1) gather information on the participants’ knowledge regarding vocal hygiene issues, and laryngeal anatomy and physiology, and (2) gather information regarding the participants’ behaviors that could impact voice production. The former will be referred to as the knowledge-based questions and the latter will be referred to as the behavioral portion from this point forward. The knowledge-based questions consisted of multiple-choice, matching, and open-ended questions. The behavioral portion of the survey was analyzed in four different groups (vocal perceptions during singing and speaking, behavioral inventory, reactions, and vocal symptoms), as described in the methodology section.

Knowledge-Based Questions

These questions consisted of multiple-choice (questions 1-10), matching (questions 13-20), and open-ended responses (questions 21-25). To analyze the knowledge-based questions on the survey, a paired sample t-test was used for each of the three sections. All three sections achieved statistically significant change in scores from pre- to post-test: The multiple choice, $t(19)=-5.54, p<.001$; matching questions, $t(19)=-3.11, p<.05$; and, the open-ended questions, $t(19)=-4.95, p<.05$. The overall score for the combined knowledge-based questions was also analyzed using a paired-sampled t-test, and a significant increase in the pre- and post-test scores was noted, $t(19)=-6.24, p<.01$. Mean scores for each section, as well as the overall section of knowledge-based questions can be seen in Figure 1.
Vocal Perceptions During Singing and Speaking

This portion of the survey consisted of questions 11 and 12, which asked participants to mark the options that perceptually rated their voices while they sang and spoke. This portion of the survey was analyzed using a paired sample t-test. There was a significant decrease in negative perceptions from the pre- to post-test, $t(19)= 2.92, p<.05$. Although there was an increase in positive perceptions from pre- to post-test, this change did not reach statistical significance, $t(19)= -1.49, p>.05$. The negative perceptions were then reverse scored, which created continuous scoring along with the positive perceptions. When both positive and negative perceptions were combined, it reached statistical significance $t(19)= -2.80, p<.05$. Mean scores for both positive and negative perceptions can be seen in Figure 2.

Figure 1. Mean scores of each section of the knowledge-based questions, as well as an overall score. Error bars denote one standard deviation around the mean.
Figure 2. Mean score for positive, negative, and overall perceptions while singing and speaking. Error bars denote one standard deviation around the mean.

Behavioral Inventory

This portion of the survey consisted of questions 26 through 34 and was analyzed qualitatively. Positive, negative, and stagnant behaviors were noted throughout questions 26 through 28.

Water intake

Pre- and post-test scores indicated that six participants increased their water intake (30%). Of the participants who did not show this improvement, 5 participants (25%) still drank the recommended 2 liters of water per day (see Figure 3).
Figure 3. Participant reports of water intake during pre- and post-testing.

Figure 4. Participant reports of caffeine intake during pre- and post-testing.
Caffeine intake

Pre- and post-test scores indicated that 10 participants (50%) decreased their caffeine intake. Although the other 10 participants did not show a decrease, they indicated to consume 1 to 2 cups or less of caffeine daily (see Figure 4).

Alcohol intake

Pre- and post-test scores indicated that eight participants (40%) decreased their alcohol intake. Of the participants who did not decrease their alcohol intake, 11 participants (55%) were still within the normal limits, which was indicated by the choice of 1 to 2 drinks per week or less (see Figure 5).

Figure 5. Participant reports of alcohol intake during pre- and post-testing.
Smoking and vaping

Pre- and post-test responses indicated that only one participant (5%) had a history of smoking, and that he quit smoking. None of the participants reported vaping on either the pre-test or the post-test.

Reflux

Pre- and post-test responses indicate no change from pre- to post-test. Five of the participants (25%) indicated being diagnosed with reflux, with similar treatments being prescribed to them.

Reactions

This section of the survey consisted of questions 35, 36, and 37 (a, b, c, i). To analyze the reaction questions of the survey, a paired sample t-test was used. Questions 35 (a) and 37 (a, b, c) were negative reactions, and thus reverse scored in order to keep with the continuous variables and scoring. Overall, there was a statistically significant increase in positive reactions, *t*(19)=-2.86, *p*<.01 (see Figure 6).

Symptoms

This section of the survey consisted of question 37 (d-h). To analyze the symptom questions of the survey, a paired sample t-test was used. Although there was a decrease in negative symptoms from pre- to post-test, this change did not reach statistical significance, *t*(19)= .06, *p*>.05 (see Figure 6). Table 1 shows the descriptive statistics resulting from pretest-posttest scores.
Figure 6. Mean scores of both the reactions and symptoms portion of the survey. Error bars denote one standard deviation around the mean.

Table 1

Descriptive Statistics for Pretest-Posttest Scores

<table>
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<tr>
<th>Sub-sections</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>t</th>
<th>p</th>
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<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Knowledge</td>
<td>18.60</td>
<td>7.41</td>
<td>27.2</td>
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</tr>
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<td>Reaction</td>
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<td>10.86</td>
<td>72.45</td>
<td>8.89</td>
</tr>
<tr>
<td>Symptom</td>
<td>10.35</td>
<td>3.34</td>
<td>10.30</td>
<td>3.44</td>
</tr>
</tbody>
</table>

Note. *M* = mean; *SD* = standard deviation; *t* = t-value; *p* = P-value.
CHAPTER 5: DISCUSSION AND CONCLUSION

The results of the present study suggested that a VHE program has the potential to increase participants’ knowledge of voice care and to change their vocally abusive behaviors. A single group, pretest-posttest design was used to gather and analyze survey data. In addition, an extensive review of the present body of literature pertaining to VHE programs with vocal performers and other populations was conducted. Findings from the current study will be discussed in relation to the research hypothesis and in relation to previous research findings.

The current study looked at change in both knowledge and behavior for vocal performers as a result of participation in a VHE program. The first hypothesis stated that participation in a VHE program would increase knowledge about voice production and vocal hygiene in vocal performers. This hypothesis was supported through the results of the current study. The participants’ knowledge regarding voice production and vocal hygiene was evaluated by having them respond to a combination of multiple-choice, matching, and open-ended questions on the survey. All three sections of the knowledge-based questions achieved a statistically significant change in scores from pre- to post-test (multiple choice, \( t(19)=5.54, p<.001 \); matching questions, \( t(19)=3.11, p<.05 \); and open-ended questions, \( t(19)=4.95, p<.05 \)). These scores were also combined to create an overall score for this section, which also achieved significant statistical change from pre- to post-test scores; \( t(19)=-6.24, p<.01 \).

These results were consistent with the literature review findings for similar studies. Previous studies found that through participation in a VHE program, populations including voice students, teachers, and kindergarten students all increased their knowledge regarding various aspects of voice production and vocal
hygiene (Bolbol et al., 2016; Pomaville & Radford, 2013, 2014; Scrimgeour & Meyer, 2002). In terms of professional voice users or students preparing for fields requiring high vocal demand, these findings suggest that many of them do not understand basic principles of voice production or how to properly take care of their voices prior to attending the VHE program. The significant increase in correct answers from pre-to post-test may also indicate that those who rely, or will rely, on their voices have a deeper appreciation and commitment to taking care of their voices than those who do not.

The second hypothesis stated that participation in a VHE program will decrease vocally abusive behaviors in vocal performers. This hypothesis was supported through the results of the current study. The current study investigated a variety of participant perceptions and behaviors that could potentially impact voice. Four sections of the questionnaire addressed this issue: vocal perception questions, a behavioral inventory, a symptoms inventory, and questions investigating their reactions to needing to cough and clear their throats.

The perception questions were designed to investigate participants’ self-perception of their voice during singing and speaking. Overall vocal perceptions during singing and speaking were found to have a positive trend, indicating that VHE decreases participants’ negative perceptions, and increases positive perceptions. There was a significant decrease in negative perceptions from the pre-to post-test, $t(19)=2.92, p<.05$. In addition, there was an increase in positive perceptions from pre- to post-test, although this change did not reach statistical significance, $t(19)=-1.49, p>.05$. These findings suggest that participation in a VHE program can increase positive perceptions and decrease negative perceptions regarding self-perceived vocal quality.
Responses on the behavioral inventory revealed an overall positive trend regarding the adoption of healthier vocal behavior following participation in the VHE program. Six participants (30%) increased their water intake, 10 participants (50%) decreased their caffeine intake, and 8 participants (40%) decreased their alcohol intake. Many of the participants were well within “acceptable ranges” for these behaviors prior to participation in the VHE program, demonstrating a high awareness in this population to start, and less room for improvement. However, positive behavioral changes were noted. In terms of smoking and vaping habits, only 1 participant (5%) had a history of smoking, and none of them reported vaping. Lastly, 5 participants (25%) indicated that they had been diagnosed with reflux on both the pre- and post-test. This indicated that either no new participants were diagnosed with reflux, or no new participants went to a physician to be assessed.

Responses to reactions also revealed an overall positive trend regarding the adoption of healthier reactions to needing to cough or clear the throat. For example, sipping water or swallowing hard rather than coughing or clearing their throat. Positive and negative reactions were intermixed throughout this portion of the survey in order to keep the participants’ attention. There was a statistically significant increase in healthier reactions of participants from pre- to post-test, \( t(19)=-2.86, p<.01 \). This finding suggests that many vocal performers may not be aware of these healthier alternatives, and that VHE can be used in order to teach them these alternatives.

Lastly, participants’ self-report of vocal symptoms was also included in the survey. Although there was a decrease in negative symptoms from pre- to post-test, this change did not reach statistical significance, \( t(19)=.06, p>.05 \). This finding suggests that attending a VHE program has the potential to decrease some
symptoms that may be experienced by vocal performers. It is also possible that some symptoms might require an extended time in which new behaviors are used before a change in symptoms are realized. Although some of the symptoms may have other underlying medical problems, it is important for vocal performers to be aware of these symptoms, and to properly manage them.

Findings from the current study contribute to the current body of evidence regarding VHE and its impact on participant behaviors. The results of previous research have been mixed. Previous research has been conducted on different populations, including vocal performers, individuals with high vocal demand, and individuals diagnosed with vocal polyps. The pilot studies conducted by Pomaville and Radford (2013, 2014) found that a VHE program had the potential to decrease vocally abusive behaviors in vocal performance college students. Other studies found differing results for this population, stating that there was no change in vocally abusive behaviors as a result of attending a VHE program (Achey et al., 2016; Broaddus-Lawrence et al., 2000). Research has also been conducted on populations that include individuals with a high vocal demand, primarily teachers of differing academic levels. These findings suggested that participation in a VHE program decreased vocal symptom disturbances (Chan, 1994; Duan et al., 2010; Faham et al., 2015; Mathur et al., 2015; Yun et al., 2007), as well as decreased vocally abusive behaviors (Bolbol et al., 2016; Pasa et al., 2007). Limited research has also been conducted on individuals diagnosed with vocal polyps who have attended a VHE program. Results of this research indicated that participation in a VHE program decreased the size of the vocal polyp, thus creating a more stable voice quality. Overall, these findings are varied, but many studies support the findings in the current study.
A number of limitations should be considered before conclusions regarding effectiveness can be drawn. The quasi-experimental nature of the research design is a drawback in the current study. Although this form of research design can be useful in identifying general trends from the results, the lack of a control group limits the ability to prove treatment efficacy and also prevents generalization of the results to the larger population of vocal performers.

One of the foremost concerns related to internal validity was the readministration of the survey. Pretest-posttest designs can be sufficient to introduce some change in the dependent variable (Hegde, 2003), however, using the same measure for both the pre-test and post-test creates the possibility of recall bias. In the current study, many participants assumed that the post-test was going to be similar to the pre-test, which may have influenced what they learned in the knowledge-based questions.

Another potential limitation is related to participant attrition. Although data for 35 participants were originally collected, data for only 20 of these participants were included in the final statistical analysis. Data remained in the analysis if the participant completed the entire pre- and post-test. Many participants failed to complete either the entire pre- or post-test or did not complete the post-test at all, in which case their data were removed. Such sample attrition could have been due to a number of factors, including a lack of interest in the study after participating in the VHE program, thus potentially skewing the results. Related to this, and a potential threat to external validity, was the small sample size. This may have impacted the statistical significance of some of the findings and limits the ability to generalize these findings to the larger population of vocal performers. Although this study aimed to include both singers and dramatic performers of all ages, the participants ended up to be mainly singers. Therefore, it is recommended that
future research include a larger number of participants who represent a greater variety of vocal performers such as more varied age groups and types of performers (i.e., singers and actors).

There are some potential limitations to note regarding the reliability of the current study, mainly due to the survey format. Although the researchers encouraged participants to respond accurately and honestly, and attempted to refine the survey questions based on the results and expert feedback from two previous pilot studies, it is possible that participants interpreted the questions differently or reported behavioral changes that did not actually exist. Interjudge relatability was determined by having a second rater independently score the open-ended responses. A point-by-point analysis was completed by comparing the student researcher’s scores with the second rater who was a licensed SLP. The percent agreement was calculated by dividing the number of agreed upon responses by the total number of response opportunities. This resulted in a 95% agreement, indicating good interjudge reliability.

**Summary**

Overall, the results of the present study supported the first hypothesis which states that vocal performers who participate in a VHE program will demonstrate an increase in their knowledge about voice production and vocal hygiene as determined by a comparison of pre- and post-test measures. This was also supported by review of the previous literature (Pasa et al., 2007; Scrimgeour & Meyer, 2002). The findings of a fairly comprehensive literature review suggested a lack of empirical evidence supporting the reduction of vocally-abusive behaviors as a result of attending a VHE program. Results of this study partially contradicts these findings, indicating that participants who attend a VHE program may have
the potential to decrease vocally abusive behaviors. Notwithstanding limitations, the following conclusions may be drawn from the study: (1) participation in a VHE program increases knowledge of voice production and vocal hygiene, (2) participation in a VHE program may reduce negative self-perceptions of voice during singing and speaking, (3) participation in a VHE program can positively influence intake of water, caffeine, and alcohol, (4) participation in a VHE program can increase healthier responses to the need for coughing and throat clearing, and (5) participation in a VHE program may decrease negative symptoms associated with voice use.

Lastly, it should be acknowledged that the present study was a collaborative effort between the Department of Music and the Department of Communicative Sciences and Deaf Studies at CSUF. Recruitment of participants would not have been possible if not for the effort put in by Dr. Radford. It is, therefore, strongly recommended that future studies explore the inter-professional collaborative process in an effort to better understand the effects of a VHE program for vocal performers.
REFERENCES


LEARN TO PROTECT YOUR VOICE

PARTICIPANTS WANTED FOR A RESEARCH STUDY

“The Effectiveness of Vocal Hygiene Education on Decreasing At Risk Vocal Behaviors in Vocal Performers”

Participants will have the opportunity to learn more about how their voice is produced through an educational seminar and discussion. It will provide factors that can contribute to maintaining a healthy voice and how to avoid developing voice problems. The seminar will present video images of common vocal pathologies such as nodules, polyps, contact ulcers, or swelling. Following the seminar will be a discussion on why these reactions may occur and how to help prevent them with behavioral changes, hydration practices, and even diet.

Eligibility Criteria
- 18 years or older
- Speaks and understands English
- Not enrolled in speech therapy for any reason

Benefits
- Free vocal education seminar
- Potential for improvement in voice production

If interested contact:
Kristi Tekerlek
kristitekerlek@mail.fresnostate.edu
APPENDIX B: CONSENT FORM
CONSENT FORM

You are invited to participate in a study conducted by Kristi Tekerlek, under the Communicative Sciences and Deaf Studies Department (CSDS) at California State University, Fresno. We hope to learn the effectiveness of vocal hygiene education (VHE) on decreasing at risk vocal behaviors in vocal performers. You were selected as a possible participant in this study because you are a vocal performer or vocal performance student, you are 18 years or older, you are not currently enrolled in speech therapy for any reason, and you speak and understand English.

If you decide to participate, you will be asked to complete a brief questionnaire assessing your general knowledge about voice production and creating a vocal behavior inventory. You will then be required to participate in a 2-hour seminar on the topic of vocal hygiene. The seminar will be offered at California State University, Fresno, on a variety of days and times to make it as convenient as possible. Approximately four weeks after attending the VHE seminar, you will be asked to complete an online post-survey, very similar to the one taken earlier.

A potential benefit of participating in this study is improved voice performance and the ability to avoid potential voice problems secondary to increasing your knowledge regarding voice production and good vocal hygiene. We cannot guarantee, however that you will receive any benefits from this study.

Potential risks may include issues associated with parking difficulties on campus, and scheduling issues.
Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. If you give us your permission by signing this document, you will be assigned a randomly generated, anonymous, identification (ID) number that you will use when responding to the required surveys. A master list of participants and ID numbers will be generated at the start of the study and will be locked in a cabinet in Dr. Pomaville’s office (PHS 231). Throughout the study, survey results and data analysis will refer to the participants as their ID number, thus maintaining their confidentiality and anonymity.

The participants will not receive compensation or payment. However, they will have the opportunity to participate in a 2-hour vocal hygiene education program free of charge. Given the hourly rate for speech therapy, the value of this program would be approximately $120-$150.

Your decision whether or not to participate will not prejudice your future relations with California State University, Fresno. If you decide to participate, you are free to withdraw your consent and to discontinue participation at any time without penalty. The Committee on the Protection of Human Subjects in the CSDS Department at California State University, Fresno has reviewed and approved the present research.

If you have any questions, please ask us. If you have any additional questions or concerns, please contact Dr. Pomaville (559-278-2732) or Kristi Tekerlek (209-954-2013). Questions regarding the rights of research subjects may be directed to
Kris Clarke, Chair, CSU Fresno Committee on the Protection of Human Subjects,
(559) 278-4468.

You will be given a copy of this form to keep.

YOU ARE MAKING A DECISION WHETHER OR NOT TO PARTICIPATE.
YOUR SIGNATURE INDICATES THAT YOU HAVE DECIDED TO
PARTICIPATE, HAVING READ THE INFORMATION PROVIDED ABOVE.

<table>
<thead>
<tr>
<th>Date</th>
<th>Signature</th>
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Signature of Witness (if any)   Signature of Investigator
APPENDIX C: PRE- AND POST-SEMINAR QUESTIONNAIRE
PRE- AND POST-SEMINAR QUESTIONNAIRE

Note: The post-seminar version of this Questionnaire did not include the Demographics section and the wording of some of the questions were adjusted by adding the phrase "Since the seminar..."

Demographics

1. What is your ID number?
2. What is your gender
   a. Male
   b. Female
3. What is your age?

Multiple-Choice Questions

Instructions: Fill out each question completely. You will not be able to come back to this section once you have moved on. You will be given 10 minutes to complete the following multiple-choice questions. When the 10 minutes are up, it will automatically advance to the next section.

1. The larynx is suspended from the ______ bone.
   a) Thyroid bone
   b) Hyoid bone
   c) Cricoid bone
   d) Mastoid bone

2. The laryngeal framework consists of 1 bone and nine _____.
   a) Muscles
   b) Membranes
   c) Cartilages
   d) Tendons

3. How many joints are contained in the larynx?
   a) 1
   b) 2
   c) 3
   d) 4

4. Which vocal fold adjustments would be responsible for raising vocal pitch? (Mark all that apply)
   a) Lengthening the vocal folds
   b) Shortening the vocal folds
c) Increase tension
d) Decrease tension
e) Increases rate of vibration
f) Decreased rate of vibration
5. Which vocal fold adjustments would be responsible for increasing vocal loudness? (Mark all that apply)
   a) Increased subglottic air pressure
   b) Decreased subglottic air pressure
c) Longer closed phase
d) Shorter closed phase
e) Less amplitude of vocal fold movement
f) Greater amplitude of vocal fold movement
6. What laryngeal attributes affect the quality of your voice? (Mark all that apply)
   a) Symmetry of vocal fold movement
   b) The pattern of vocal fold closure
c) Degree of tension in the laryngeal musculature
d) The presence of vocal fold pathology
7. What is the average vocal fold vibration rate (cycles per second) for women?
   a) 125-150
   b) 175-200
c) 225-250
d) 250-300
8. What is the average vocal fold vibration rate (cycles per second) for men?
   a) 100-125
   b) 125-150
c) 175-200
d) 200-225
9. Are your vocal folds muscles?
   a) Yes
   b) No
10. What is the recommended minimum amount of water intake for a day?
    a) 4 liters (approximately 20 cups)
    b) 3 liters (approximately 15 cups)
c) 2 liters (approximately 10 cups)
d) 1 liter (approximately 5 cups)
11. Generally, when singing, (circle all that apply to you)
    a) I am satisfied with the quality of my voice
    b) I am satisfied with the vocal endurance
c) My voice is consistent on a daily basis
d) My voice gives out too soon/ fatigues easily
e) My voice is too breathy
f) My voice is hoarse
g) My voice is not loud enough
h) My voice is too loud
i) My pitch range is less than I would like

12. Generally, when speaking, (circle all that apply to you)
   a) I am satisfied with the quality of my voice
   b) I am satisfied with my vocal endurance
   c) My voice is consistent on a daily basis
   d) My voice gives out too soon/fatigues easily
   e) My voice is too breathy
   f) My voice is too hoarse
   g) My voice is not loud enough
   h) My voice is too loud
   i) My vocal pitch is too low
   j) My vocal pitch is too high

Matching

Instructions: Fill out each question completely. Keep in mind that you will not be able to come back to this section once moving on. You will be given 10 minutes to complete the following multiple-choice questions. When the 10 minutes are up, it will automatically advance to the next section.

15. Bumps that appear on the posterior vocal folds (near the arytenoids), often caused by behaviors that slam the arytenoids together, may be unilateral (on 1 fold) or bilateral (both folds).
16. A type of reflux commonly associated with voice problems, often called “silent reflux”.
17. Bumps that appear near the anterior-to-middle third of the vocal folds, often caused by chronic vocal abuse/misuse, often start out unilateral and become bilateral
18. Soft, fluid-filled bumps that appear on the vocal folds, often caused by abuse or misuse behaviors, usually unilateral.
19. The sensation of tightness or a “lump in the throat”.
20. The etiology characterized by vocal fold stiffness and often associated with chronic smoking and/or alcohol abuse.
   a) Cysts
   b) Nodules
   c) GERD
   d) Supraglottic compression
e) Hemorrhage
f) Laryngeal hypertension
g) Globus
h) Laryngitis
i) Granuloma
j) LPR
k) Contact ulcers
l) Hematoma
m) Polyps
n) Laryngeal carcinoma
o) LRD
p) Glottal fry

Open-Ended Questions

Instructions: Fill out each question completely. Keep in mind that you will not be able to come back to this section once moving on. You will be given 15 minutes to complete the following open-ended question. When the 15 minutes are up, it will automatically advance to the next section.

21. List 3 conditions or behaviors that would require increasing your water intake beyond the minimum recommended amount.
22. Why is adequate hydration important for singers?
23. List 4 vocal abuse or misuse behaviors.
24. List 5 vocal or laryngeal symptoms or “red flags” that there may be something negative happening in your larynx.
25. What is Laryngeal Hyperfunction?

Behavioral Inventory

Instructions: Mark which applies best to you.

26. How much water do you typically drink per day?
   a) Less than 2 cups
   b) 2 to 4 cups
   c) 5 to 8 cups (over 1 liter, but not 2 liters)
   d) 9 to 12 cups (approximately 2 liters)
   e) 13 to 16 cups (approximately 3 liters)
   f) More than 3 liters per day

27. How much caffeine do you typically drink per day (coffee, tea, caffeinated sodas, etc.)?
   a) None
   b) Occasional, but less than 1 cup per day
   c) 1 to 2 cups
d) 3 to 5 cups  
e) More than 5 cups  
28. What is your alcohol intake?  
a) None  
b) Occasionally, but less than one drink per week  
c) 1 to 2 drinks per week  
d) 3 to 5 drinks per week  
e) Daily  
29. Do you smoke?  
a) Yes  
b) No  
30. If yes, how many times per day?  
31. Do you vape?  
a) Yes  
b) No  
32. If yes, how many times per day?  
33. Have you ever been diagnosed with reflux?  
a) Yes  
b) No  
34. If yes, how is it being treated?  
The following are ranked on a rating scale: All the time, most of the time, occasionally, rarely, never.  
35. If you feel like you need to cough or clear your throat, how do you typically react?  
a) Cough or clear my throat until the sensation goes away.  
b) Swallow hard.  
c) Sip some water.  
d) Produce a “silent cough”  
36. If you experience a hoarse voice or vocal fatigue, how do you typically react?  
a) Increase my fluid intake.  
b) Stop singing, but talk as usual.  
c) Stop talking, but sing as usual.  
d) Continue talking and singing, but reduce the amount by taking some vocal rest periods.  
e) Whisper to communicate.  
f) Use a humidifier.  
g) Avoid alcohol.  
h) Avoid caffeine.  
i) Avoid spicy foods.  
j) Cancel activities that require extensive or loud vocalizations.  
k) Increase my amount of sleep.
l) Avoid smoke and smokey environments.
m) Use cough drops/lozenges or other medications to soothe the throat.
   n) Use antihistamines.
o) Consider dietary changes or avoid certain foods.
The following are ranked: More than twice a day, 1 to 2 times per day, 1 to 5 times a week, less than once a week, and never.
37. Rate the following:
   a) How often do you typically cough or clear your throat?
   b) How often do you yell or shout?
   c) How often do you need to speak loudly or for an excessive period of time (longer than an hour)?
   d) How often do you experience heartburn or tightness in your chest?
   e) How often do you feel tension in your throat or like there is a “lump in your throat”?
   f) How often do you feel like your singing/voicing is effortful?
   g) How often do you lose your voice?
   h) How often do you experience pain in your throat?
   i) How often do you complete vocal “warm ups” or vocal exercises?
APPENDIX D: OUTLINE OF VHE PROGRAM
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1. Anatomy of the Larynx
   a. Framework of the larynx
   b. Laryngeal muscles

2. Physiology of Voice Production
   a. Pitch control
   b. Loudness (intensity)
   c. Relationship between pitch and loudness
   d. Quality

3. Contributors to Voice Problems
   a. Cycles of abuse
   b. At-risk behaviors
      i. Vocal abuse behaviors
      ii. Vocal misuse behaviors
   c. Other etiological factors
      i. Personality and emotional factors
      ii. GERD and LPR
      iii. Hormones

4. Videos Representing the Most Common Etiologies
   a. Normal male (video)
   b. Normal female (video)
   c. Laryngeal hyperfunction (video)
   d. Laryngitis (picture)
   e. Reinke’s Edema (video)
   f. Nodule (picture)
g. Prenodules (video)

h. Nodules (video)

i. Nodules (video)

j. Polyp (picture)

k. Gelatinous polyp (video)

l. Fibrous polyp (video)

m. Hemorrhage (picture)

n. Hemorrhage (video)

o. Contact ulcer (picture)

p. Granuloma (picture)

q. Contact granuloma (video)

r. Cancer (video)

5. Symptoms that There May Be Something Going on in the Larynx

6. Vocal hygiene

   a. Hydration

   b. Eliminate ‘at risk’ behaviors

   c. Vocal rest vs. voice conservation

   d. Warm-ups and exercises

   e. Use of proper technique