

Andrews University

Digital Commons @ Andrews University

Master's Theses

Graduate Research

2017

A Comparison Of Vocal Health, Hygiene, And Perceptions In Student Teachers, Voice Music Majors, and Speech-Language Pathology Majors: A Preliminary Study

Kenreah LaVaughn Brown
Andrews University, kenreah@andrews.edu

Follow this and additional works at: <https://digitalcommons.andrews.edu/theses>



Part of the [Speech Pathology and Audiology Commons](#)

Recommended Citation

Brown, Kenreah LaVaughn, "A Comparison Of Vocal Health, Hygiene, And Perceptions In Student Teachers, Voice Music Majors, and Speech-Language Pathology Majors: A Preliminary Study" (2017). *Master's Theses*. 108.

<https://dx.doi.org/10.32597/theses/108/>

<https://digitalcommons.andrews.edu/theses/108>

This Thesis is brought to you for free and open access by the Graduate Research at Digital Commons @ Andrews University. It has been accepted for inclusion in Master's Theses by an authorized administrator of Digital Commons @ Andrews University. For more information, please contact repository@andrews.edu.

2017

A Comparison of Vocal Health, Hygiene, and Perceptions in Student Teachers, Voice Music Majors, and Speech-Language Pathology Majors: A Preliminary Study

Kenreah Brown

ABSTRACT

A COMPARISON OF VOCAL HEALTH, HYGIENE, AND PERCEPTIONS IN
STUDENT TEACHERS, VOICE MUSIC MAJORS, AND SPEECH-
LANGUAGE PATHOLOGY MAJORS:
A PRELIMINARY STUDY

by

Kenreah LaVaughn Brown

Chair: Tammy Shilling

ABSTRACT OF GRADUATE STUDENT RESEARCH

Thesis

Andrews University

School of Health Professions

Title: A COMPARISON OF VOCAL HEALTH, HYGIENE, AND PERCEPTIONS IN STUDENT TEACHERS, VOICE MUSIC MAJORS, AND SPEECH-LANGUAGE PATHOLOGY MAJORS: A PRELIMINARY STUDY

Name of researcher: Kenreah LaVaughn Brown

Name and degree of chair: Tammy Shilling, M.A. CCC-SLP

Date completed: July 2017

Problem

There are many college/university students studying to become teachers, professional singers, and speech-language pathologists. Yet, despite research available on the risk of developing voice disorders in these areas of study, very little was found on such individuals while in the college setting. This is particularly true for speech-language pathologists who have limited research available overall.

Method

Nineteen students between the ages of 18- 43 years old, completed pre-and-post-testing of the Glottal Function Index (GFI), Voice Hygiene Questionnaire (VHQ), and the objective measures (maximum phonational frequency range, sustained phonation, jitter,

and shimmer).

Results

The chi-square of independence results showed that the relationship between these scores is not significant (Sig. = .84). The independent samples t-test resulted in no significant difference between student teachers/music majors and speech-language pathology majors in GFI scores (Sig. = .34), VHQ scores (Sig. = .32), jitter scores (Sig. = .55), or shimmer scores (Sig. = .26).

Conclusion

Having an increase in the Glottal Function Index score does not affect the increase of a jitter score in an individual. Likewise, when pre-and post-scores of GFI, VHQ, jitter, and shimmer were compared between the two groups, there was no significant difference. However, due to the small sample size, further studies with a larger sample size are needed to substantiate our findings.

Andrews University

School of Health Professions

A COMPARISON OF VOCAL HEALTH, HYGIENE, AND PERCEPTIONS IN
STUDENT TEACHERS, VOICE MUSIC MAJORS, AND SPEECH-
LANGUAGE PATHOLOGY MAJORS:
A PRELIMINARY STUDY

A Thesis
Presented in Partial Fulfillment
of the Requirements for the Degree
Master of Science

by

Kenreah LaVaughn Brown

2017

©Copyright by Kenreah L. Brown 2017
All Rights Reserved

A COMPARISON OF VOCAL HEALTH, HYGIENE, AND PERCEPTIONS IN
STUDENT TEACHERS, VOICE MUSIC MAJORS, AND SPEECH-
LANGUAGE PATHOLOGY MAJORS:
A PRELIMINARY STUDY

A thesis
presented in partial fulfillment
of the requirements for the degree
Master of Science

by

Kenreah LaVaughn Brown

APPROVAL BY THE COMMITTEE:

Tammy Shilling, M.A., CCC-SLP, Chair

Tevni Grajales, PhD

Charles Reid, M.M

Luana Greulich, PhD

Date approved

DEDICATION

I dedicate this thesis to God who has gotten me through this process every step of the way. I honestly believe that without Him, this would not have been nearly as successful and for that, I am grateful.

“I will praise You, O Lord, with my whole heart; I will tell of all Your marvelous works.”

Psalms 9:1, NKJV

TABLE OF CONTENTS

LIST OF TABLES	vii
LIST OF ABBREVIATIONS.....	viii
ACKNOWLEDGEMENTS	ix
Chapter	
1. INTRODUCTION TO STUDY, RESEARCH PROBLEM, QUESTIONS, AND HYPOTHESES	1
Introduction.....	1
Statement of the Problem.....	2
Purpose of the Study	2
Research Questions	3
Research Hypotheses	4
Operational Definitions.....	5
2. LITERATURE REVIEW	7
Introduction.....	7
Identification of Articles for Literature Review	7
Definitions of Voice Disorders and Vocal Hygiene/Habits.....	8
Occupational Voice Users.....	8
Teachers and Singers as Occupational Voice Users	9
Gender’s Role in Vocal Health.....	11
Teaching and Singing within the College Setting.....	11
Perception of Voice Disorders in Teachers and Singers.....	13
Speech-Language Pathology’s Role in Treating Voice Disorders	14
Speech-Language Pathologists as Occupational Voice Users	16
Conclusion	17
3. METHODOLOGY	18
Introduction.....	18
Research Design.....	19
Selection and Description of Sample	19
Research Hypotheses/Null Hypotheses	21

Research Hypothesis/Null Hypothesis 1.....	21
Research Hypothesis 1	21
Null Hypothesis 1	21
Research Hypothesis/Null Hypothesis 2.....	21
Research Hypothesis 2.....	21
Null Hypothesis 2	21
Research Hypothesis/Null Hypothesis 3.....	21
Research Hypothesis 3.....	21
Null Hypothesis 3	21
Research Hypothesis/Null Hypothesis 4.....	22
Research Hypothesis 4.....	22
Null Hypothesis 4	22
Research Hypothesis/Null Hypothesis 5.....	22
Research Hypothesis 5.....	22
Null Hypothesis 5	22
Materials and Instrumentation	22
Statistical Analysis.....	25
4. RESULTS	27
Introduction.....	27
Participants.....	27
Variables Description.....	28
Hypotheses Testing.....	31
Hypothesis 1.....	31
Null Hypothesis 1	31
Hypothesis 2.....	32
Null Hypothesis 2	32
Hypothesis 3.....	33
Null Hypothesis 3	33
Hypothesis 4.....	33
Null Hypothesis 4	33
Hypothesis 5.....	34
Null Hypothesis 5	34
Summary	34
5. SUMMARY, DISCUSSION, AND CONCLUSION.....	36
Introduction.....	36
Research Problem	36
Methodology	36
Results.....	37
Discussion.....	37
Conclusion and Recommendations.....	39

Appendix

A. QUESTIONNAIRES AND ASSESSMENTS.....	42
REFERENCE LIST	46

LIST OF TABLES

1. Frequencies of Gender, Age, and Majors	28
2. Descriptive Statistics of Variables	30
3. Descriptive Statistics for Differences in Pre- and Post-Test Scores	30
4. Crosstabulation – GFI Change * Jitter Change.....	31
5. Chi-Square Tests.....	32

LIST OF ABBREVIATIONS

ASHA	American Speech-Language-Hearing Association
dB	Decibel
GFI	Glottal Function Index
SPSS	Statistical Package for the Social Sciences
VHI	Voice Handicap Index
VHQ	Vocal Hygiene Questionnaire

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to my committee chair, Mrs. Tammy Shilling, who has been a great support since the beginning of this endeavor. It was because of her that I was able to stay on task and complete this project.

To my committee members, Dr. Tevni Grajales, Professor Charles Reid, and Dr. Luana Gruelich, I would also like to express great appreciation. Dr. Tevni Grajales supported me by providing me knowledge and assistance in the methodological and statistical aspects of this study. Professor Charles Reid, and Dr. Luana Gruelich supported me by providing knowledge in their respective fields of music and education, and by always being willing to give me advice/suggestions when asked.

Finally, I would like to express my deepest gratitude to my friends and family. They were the ones who always encouraged me to pursue my goals and dreams regardless of how difficult the process was. Their motivation, prayers and support helped me persevere and complete this endeavor. For that, I will always be grateful.

CHAPTER 1

INTRODUCTION TO STUDY, RESEARCH PROBLEM, QUESTIONS, AND HYPOTHESES

Introduction

Research from an allied health perspective on the voice has found that individuals in occupations requiring high usage of their voice tend to suffer most from vocal damage. This is especially true for those who fail to implement procedures necessary to minimize risk of injury to their voices. There are several occupations consistently studied in this field of research, specifically singers/performers and teachers. Through research, these two groups have proven to be high occupational voice users and are at risk of developing voice disorders as a result.

Voice disorders, according to the American Speech-Language-Hearing Association in their document entitled ‘Definitions of Communication Disorders and Variations, is defined as “the abnormal production and/or absences of vocal quality, pitch, loudness, resonance, and/or duration, which is inappropriate for an individual's age and/or sex” (1993). The possible pathology of a voice disorder could include vocal nodules, vocal polyps, swelling, edema and redness of the laryngeal vestibule and vocal cords.

While teachers and singers/performers are known to be at risk of developing voice disorders, there are other groups that could also be considered occupational

voice users but have very limited research available on them. This is especially true for speech-language pathologists who commonly treat voice disorders themselves, but often fail to be identified within research as professionals who consistently use their voices for long periods of time. Further research in the field of allied health is needed to determine the degree speech-language pathologists are affected in terms of voice usage.

Statement of the Problem

There are many college/university students studying to become teachers, professional singers, and speech-language pathologists. Yet, despite research available on the risk of developing voice disorders in these areas of study, very little is available on such individuals while in the college setting. This is particularly true for speech-language pathologists who have limited research available overall.

Purpose of the Study

The purpose of this study is to initially determine the vocal health, hygiene, and perceptions of students studying in the college environment specifically in the fields of education, speech-language pathology, and music with an emphasis on the voice. It is believed that many students within these fields do suffer from voice concerns while still in school.

Research has already shown that teachers in the field are at great risk of developing voice disorders due to a variety of factors such as speaking in noisy environments (loud classrooms) and speaking for prolonged periods of time (Morrow & Connor, 2011; Munier & Farrell, 2016; Williams, 2003). The same is also true for

professional singers with factors such as using an injured voice without giving it proper rest (Franca & Wagner, 2015).

While there are studies that reflect the prevalence of voice disorders in teachers and professional singers, the number of studies that discuss prevalence of voice disorders in speech-language pathologists is rather limited. However, these three professions have many factors in common that could suggest a risk of voice disorders in speech-language pathologists. This includes being a high-occupational voice user and the gender of the majority of individuals in this profession, since studies have shown that females have a greater risk of developing voice disorders than males, and the majority of teachers and speech-language pathologists are female (Hunter, Tanner, & Smith, 2011; Smith, Kirchner, Taylor, Hoffman, & Lemke, 1998).

If proper education and/or training could be provided while individuals are still studying these areas in the college/university setting, it may be possible to prevent some of the vocal injuries that occur within the professional setting. Findings from this study could suggest a further need for vocal hygiene education as part of the curriculum.

This is a preliminary study due to the small sample size and lack of corresponding research studies found in the specific field of speech-language pathology. As a result, this is an area that is upcoming and necessary for future research.

Research Questions

The questions this study will attempt to answer are as follows:

1. Are increased Glottal Function Index (GFI) scores and increased jitter scores dependent?
2. Is there a significant difference in GFI scores between student teachers/music majors and speech-language pathology majors?
3. Is there a significant difference in Voice Hygiene Questionnaire (VHQ) scores between student teachers/music majors and speech-language pathology majors?
4. Is there a significant difference in jitter scores between student teachers/music majors and speech-language pathology majors?
5. Is there a significant difference in shimmer scores between student teachers/music majors and speech-language pathology majors?

Research Hypotheses

1. Increased GFI scores and increased jitter scores are dependent.
2. There is a significant difference in GFI scores between student teachers/music majors and speech-language pathology majors.
3. There is a significant difference in VHQ scores between student teachers/music majors and speech-language pathology majors.
4. There is a significant difference in jitter scores between student teachers/music majors and speech-language pathology majors.
5. There is a significant difference in shimmer scores between student teachers/music majors and speech-language pathology majors.

Operational Definitions

The American Speech-Language-Hearing Association (ASHA): This is “the national professional, scientific, and credentialing association for members and affiliates who are audiologists; speech-language pathologists; speech, language, and hearing scientists; audiology and speech-language pathology support personnel; and students” (ASHA, n.d.).

Dysphonia: This refers to an “impairment of the speaking or singing voice and arises from an abnormality of the structures and/or functions of the voice production system and can cause bodily pain, a personal communication disability, and an occupational or social handicap” (American Speech-Language Hearing Association, 2005).

Glottal Function Index (GFI): This is a 4-item symptom index that allows an individual to self-assess the degree to which signs of glottal dysfunction is present.

Jitter: measured in percent (%), is the variation in frequency found in a person’s voice. This measure is utilized to substantiate normal or abnormal vocal quality, such as hoarseness or harshness.

Maximum Phonational Frequency Range: This is the difference between the lowest pitch and highest pitch a person is capable of producing.

Occupational Voice Users: Persons in jobs requiring heavy use of the voice
Shimmer - measured in decibels (dB), is the variation in amplitude in the voice of an individual. This measure is utilized to substantiate normal or abnormal vocal quality, such as hoarseness or harshness.

Speech Usage: The use of speech in everyday situations in order to meet

communication demands

Sustained Phonation: Also known as maximum phonation time, this is a measurement of how long an individual is capable of holding a steady pitch after maximum inhalation has taken place.

Vital Capacity: The measurement of the greatest volume of air that can be expelled from the lungs after a full inspiration.

Vocal Hygiene/Habits: A term used to refer to practices that can either aid in the maintenance of a healthy voice, or cause damage to the voice.

Vocal Hygiene Questionnaire (VHQ): This is a questionnaire that assesses the degree habits harmful to the voice are present. Questions in the questionnaire related to rest, vocal habits (screaming/yelling, coughing or throat clearing consistently, etc.) diet and medication taken regularly.

Voice Disorders: “the abnormal production and/or absences of vocal quality, pitch, loudness, resonance, and/or duration, which is inappropriate for an individual's age and/or sex” (American Speech-Language Hearing Association, 1993). Possible pathologies of a voice disorder could include vocal nodules, vocal polyps, swelling, edema and redness of the laryngeal vestibule and vocal cords.

CHAPTER 2

LITERATURE REVIEW

Introduction

This chapter reviews research and literature related to occupational voice users, and their risk of developing voice disorders. Information will be provided on who an occupational voice user is, the risks involved in being in a profession with this label, and how vocal hygiene, health, and perceptions can impact such an individual's potential in developing voice disorders. This chapter will also further discuss specific occupations frequently identified (or not) as occupational voice users in research, and reasons provided for the high-risk present with these particular individuals.

Identification of Articles for Literature Review

Articles and reports used in this preliminary study involved research conducted between 1997 and 2017. The databases and resources used included: ScienceDirect, Sage Journals, National Institutes of Health, EBSCOhost, and Springer Link. Terms used in the word search included variations of the following: voice disorders, vocal hygiene, voice disorders in singers/teachers, vocal health in student teachers/music majors/education majors/speech language pathology majors, and prevalence of voice disorders among genders. This article focused on prevalence of voice disorders and vocal hygiene/habits rather than treatment and

recommendations. As a result, articles that focused primarily on treatment and recommendations were omitted. In total, approximately 53 articles were gathered and with the inclusion and exclusion criteria 35 were chosen specifically for the literature review.

Definitions of Voice Disorders and Vocal Hygiene/Habits

The use of speech in everyday situations in order to meet communication demands is known as “speech usage”. Speaking demands will typically fluctuate due to factors such as personality, communication preferences, and occupation among several others (Anderson, Baylor, Eadie, & Yorkston, 2016). Demands an individual might have could increase speech usage levels and therefore increase the risk of developing voice disorders.

The American Speech-Language-Hearing Association (ASHA), the national professional, scientific, and credentialing association for individuals such as audiologists, speech-language pathologists, and students studying these professions, (1993) defines voice disorders as being “the abnormal production and/or absences of vocal quality, pitch, loudness, resonance, and/or duration, which is inappropriate for an individual's age and/or sex.” Many of these voice disorders are due to vocal abuse and misuse, whether it was long term, or from a single event. Examples of vocal abuse include smoking, drinking caffeine and alcohol, talking loudly, coaching, and singing (ASHA, n.d.).

Occupational Voice Users

Many careers require the ability to use the voice frequently and consistently.

Individuals in such occupations that require heavy use of the voice are known as occupational voice users. Considering the importance of the voice in many jobs, it is therefore understandable why certain occupations have a higher risk of voice disorders in comparison to others. Authors Titze, Lemke, and Montequin (1997) found in their report that occupations that relied heavily on their voice within the United States of America included singers, actors, telemarketers, teachers, receptionists, emergency vehicle dispatchers, and broadcasters. More recently, it was stated that almost one quarter of the US workforce falls into this category known as occupational voice users (Hunter & Titze, 2010; Wilson, 2013). In N. R. Williams' (2003) review, he found that results from studies within the U.S. and Sweden combined, stated salespersons, factory workers, clerical workers, teachers, counsellors, and singers to be occupations at risk of voice disorders.

Teachers and Singers as Occupational Voice Users

In the occupations mentioned previously, there are a select few that are addressed in research repeatedly. These include the professions of teaching and singing. Studies show that in comparison to individuals with professions outside of teaching, teachers worldwide have “significantly higher rates of voice-use problems” (Morrow & Connor, 2011; Munier & Farrell, 2016; Williams, 2003). For example, a study discovered that out of 1,243 teachers and 1,288 non-teachers (individuals in any occupation outside of teaching) 58% of teachers and 29% of non-teachers reported experiences when their voice failed to perform as it normally should and interfered with communication (Roy et al., 2004). Several reasons are given by Morrow and

Connor (2011) as to why voice problems may be a predictable consequence for teachers, for instance, “prolonged voice use, poor acoustics, high background noise, and increased vocal effort to speak loudly enough to be heard by students”. Teaching in such noisy environments with increased volume daily without time to rest the voice can, and does, consequentially lead to voice disorders being an occupational hazard (Roy et al, 2004).

Singers, as stated by Cohen et al. (2007), also represent a unique population. They were found to have a greater risk of obtaining voice disorders in comparison to non-singers and “had more self-reported voice problems and more vocal disability”. For those who choose to improve their vocal abilities with pursuit of a professional career in mind, the training demands are great and voice performance is typically impacted by outside (environmental) factors. One such factor is illness. Braun-Janzen and Zeine (2009) explain how singers are often faced with several types of voice disorders or illnesses (gastroesophageal reflux disease for example) at rather inconvenient times, such as close to a scheduled performance. Many take steroids and other prescription and over-the-counter drugs without knowing the effects they may have on the vocal folds. It is due to reasons such as using the voice without rest and not allowing adequate time for the voice to recover after voice injury takes place, that explain the increased chance of developing voice disorders in singers (Franca & Wagner, 2014).

With the risk being so high in both educators and singers, it also comes as no surprise to know that music educators specifically have a high risk of obtaining voice disorders. According to Morrow and Connor (2009), music teachers are

approximately four times more likely than classroom teachers to develop issues related to the voice.

Gender's Role in Vocal Health

Despite the fact that occupations seem to play a major role in who is at a greater risk for voice disorders, gender appears to play an important role as well. According to authors Hunter et al. in their study entitled "Gender Differences Affecting Vocal Health of Women in Vocally Demanding Careers" (2011), women typically suffer from voice-related problems more often than men regardless of their occupation. The study further states that women are almost twice as likely to report a history of voice problems in comparison to men.

This high rate among women is agreed upon in many other studies. For example, in the study "Voice Problems Among Teachers: Differences by Gender and Teaching Characteristics", it was found that female teachers reported voice concerns more often (Smith et al., 1998). There are generally more women than men in the education field, so these findings are not surprising. According to Snyder, de Brey, and Dillow from the National Center for Education Statistics, in the year 2011-2012 about 76 % of public school teachers in the United States were female (2016).

Teaching and Singing within the College Setting

While there are many studies available that focus on these two specific occupations (teaching and singing), the number of recent studies available on students studying in these fields within a college setting were difficult to find. However, the studies that are available show the existence of the risk of students and newly hired

professionals in these areas developing voice disorders even at this stage in their lives.

In one such study it was discovered that in a group of female teachers practicing within the first four years of their career, 41.3% had voice complaints and reported a history of voice complaints during their training period as well. Furthermore, while significantly less female student teachers in this study reported voice complaints within the past year in comparison to the practicing teachers, approximately 39.7% of student teachers did have voice complaints (Thomas, Kooijman, Cremers & Jong, 2005).

In another study, first-year undergraduate musical theater majors were given questionnaires with the purpose of gathering information on their baseline vocal habits and health. The results showed that over half of the participants involved in the study had reported at least one current negative vocal symptom. It is studies like these that show that risk for voice disorders within these fields exists long before a person actually begins his or her career.

Franca and Wagner (2014) discuss the copious amount of training needed to control processes such as respiration, phonation, and resonance in a way to ensure that the professional singing voice is refined. When students are studying to become professional singers, they are expected to maintain a high level of skill that is very demanding on the voice. Therefore, it is not surprising to find research that focuses on the vocal demands within this profession.

Perception of Voice Disorders in Teachers and Singers

Several studies available on voice disorders use a combination of both subjective and objective measures when assessing individuals. Objective measures include instruments, such as the Visipitch, which are used to analyze characteristics of a person's voice and produce measurements that can be reported on.

Subjective measures include surveys and questionnaires that allow a person to assess his or her own voice. Examples of standardized perceptual assessments of voice quality include the GFI, the Vocal Fatigue Index, the Voice Handicap Index (VHI), and the Singing Voice Handicap Index (Bach, Belafsky, Wasylik, Postma, & Koufman, 2005; Cohen et al., 2007; Nanjundeswaran, Jacobson, Gartner-Schmidt & Abbott, 2015).

Subjective measures are used frequently because it allows researchers to analyze how participants in studies perceive their own voices. The hope is that the concerns mentioned by individuals would be reflected in the objective measures as well. In a study by Maria Claudia Franca and Jeanine F. Wagner (2014), eight student singers were given assessments such as the VHI several times for an extended period of time. Their findings showed that about 50% reported using their voice with excessive effort and that 25% had occasional to frequent symptoms of hoarseness.

In another study, 457 student teachers were given a questionnaire survey with questions related to factors that could suggest a risk of developing voice disorders as well as questions that allowed them to report current voice complaints. They were later given the VHI to complete as well. When compared to a control group of individuals not in the field of teaching, it was found that the amount of student

teachers that complained about current voice concerns was much higher than the amount found in the control group. The group of student teachers with current voice complaints also had significantly higher VHI scores than the student teachers without current voice complaints (Thomas et al., 2005).

Subjective voice measures allow researchers to not only see how individuals perceive their own voice quality, but also allow researchers to observe possible psychosocial and emotional consequences of a voice disorder. In a study on a general college population, it was found that 29% of the participants reported previously having a voice disorder that interfered with their ability to communicate with others. Some of the students were effected psychosocially and socio-emotionally as a result (Merrill et al., 2013).

Studies like these show that individuals, specifically those in the college setting, are often able to not only perceive when something is wrong with their voice, but are affected psychosocially and emotionally by more serious concerns that arise with their voices. This could be true for student teachers and student singers who are already at risk for developing voice disorders.

Speech-Language Pathology's Role in Treating Voice Disorders

Speech-language pathologists are one of a few professionals that work with persons with voice disorders. The American Speech-Language-Hearing Association states that the overall objective is “to optimize individuals' abilities to communicate and to swallow, thereby improving quality of life” (2017). A typical screen according to ASHA may include either a formal or informal screening tool. Standardized

questionnaires such as the GFI or the VHI can also be included. Such a screen would involve an evaluation of voice-related characteristics such as respiration, phonation, resonance, vocal range, and flexibility. If abnormalities are detected during the screening, further evaluations would be administered. This includes an examination by a physician which could occur prior to or following a voice evaluation by a speech-language pathologist.

Treatment of voice disorders varies based on pathology and severity. As a result, speech-language pathologists typically collaborate with several medical professionals to determine a treatment plan most suitable for the patient. Treatment however would usually involve a combination of direct (i.e manipulation of mechanisms that produce voice) and indirect (e.g. patient education and counseling) approaches (ASHA, 2017).

While ASHA's objective involves use of prevention, assessment, and treatment, research is also needed in order to continually improve the field as a profession. As a result, speech-language pathology has been instrumental in research related to voice disorders.

While more research is still needed, there are several studies available on individuals who would be considered occupational voice users. Previously mentioned examples include salespersons, factory workers, actors, telemarketers, teachers, receptionists, emergency vehicle dispatchers, and broadcasters (Hunter & Titze, 2010; Titze et al., 1997; Williams, 2003; Wilson, 2013). However, very few of these studies actually discuss speech-language pathologists as being occupational voice users.

Speech-Language Pathologists as Occupational Voice Users

As mentioned earlier in the chapter, an occupational voice user can be defined as an individual whose voice is vital for their profession. As a result, speech-language pathologists who focus heavily on communication in all forms, would fall within this category. Like teachers, the voice is probably the greatest tool of individuals in this field of choice. This means that the risk of developing voice disorders would most likely be high in the profession in comparison to those in fields that do not need to use the voice to a greater extent.

Another factor speech-language pathologists have in common with teachers is gender. According to the United States Department of Labor, 98.4% of all speech-language pathologists are women. This statistic would support the higher risk of developing voice disorders based on the previously discussed results of gender. (Hunter et al., 2011).

While this group of professionals are knowledgeable on proper vocal hygiene, it is not known to what extent this knowledge minimizes the amount of vocal damage that occurs within this occupation. An article entitled “Voice Problems of Future Speech-Language Pathologists” by Gottliebson, Lee, Weinrich, and Sanders (2007) found that in their study of 104 first year graduate students studying speech-language pathology about 12% had voice problems, which is more than the three to nine percent in the general population. This score, while still lower than the study’s findings for education majors (21%) and the general college population (17%), was still considered higher than expected for a group of individuals who study about voice disorders and must be able to implement healthy voice practices in all clinical settings

they work in.

Conclusion

There are many occupations that would be labeled as heavy voice users. Careers involving teaching and singing are perhaps the best known within this category. There was limited research found in the college setting, however, the studies that are available are consistent in reporting a high risk of developing vocal disorders.

However, speech-language pathology is a field that has yet to be seriously studied as occupational voice users. Not many articles exist on this population in the workforce or college setting and it is believed that further research with this group would be beneficial.

CHAPTER 3

METHODOLOGY

Introduction

Research on the voice has found that individuals in occupations requiring high usage of their voice tend to suffer most from vocal damage. This is especially true for those who fail to implement procedures necessary to minimize risk of injury to their voices. There are several occupations consistently studied in research, specifically singers/performers and teachers. Through research, these two groups have proven to be high occupational voice users and are at risk of developing voice disorders even pre-professionally when they are still in college.

There are other groups that could also be considered occupational voice users but have very limited research found on them such as speech-language pathologists. This is a group of professionals who commonly treat voice disorders themselves, but often fail to be identified within research as professionals who consistently use their voices for long periods of time.

The purpose of this study is to provide preliminary data with the aim of determining the vocal health, hygiene, and perceptions of students studying in the college environment specifically in the fields of education, speech-language pathology, and music with an emphasis on the voice. It is believed that many students within these fields do suffer from voice concerns while still in school. Findings from

this study would suggest a further need for vocal hygiene education as part of the curriculum.

Research Design

This is a comparative and correlational study. The GFI, VHQ, jitter, and shimmer scores of two groups (speech-language pathology majors and student teachers/voice music majors) are being compared to determine similarities and/or differences between them. Glottal Function Index and jitter scores are also being analyzed to determine whether dependency or independency exists between them.

Selection and Description of Sample

Participants were approached in two main ways: (1) flyers about the study were posted throughout the university (i.e., all department offices, dormitories, and the campus center where places such as the cafeteria are located), and (2) four universities within 50 miles of Andrews University were contacted either by phone, email, or both to request permission to advertise the study with the poster, which was sent by email and then announced to the students attending those schools.

Students were then able to contact either the researcher or supervisor via telephone numbers or email addresses provided on the posters. A brief explanation of the study was provided and, should the student remain interested in participating, an appointment was arranged to meet in order to obtain the consent form and then begin the assessment process. While the sample size was small due to few students agreeing to participate, there was some variety in majors and age-range. Both genders were represented as well.

Students who expressed an interest in participating and agreed arranged 15-20-minute appointments with one of two people responsible for assessment and data collection. The appointments were located in the Speech-Language Pathology & Audiology Department at Andrews University. When students arrived to the department, they were directed towards the speech lab where the Visi-Pitch was located.

Once entering the speech lab, students were provided with the consent form which was reviewed with them by one of the two evaluators. Once the consent forms were signed, time was allotted for the students to complete the questionnaires given. Following the questionnaires, the objective measures were taken with the Visi-Pitch and recorded. See Appendix A for the questionnaires (GFI and VHQ) and Visi-Pitch Acoustic Measures sheet. Participants were contacted at a later date to arrange appointments for post testing involving repeating the GFI and VHQ questionnaires and the Visi-Pitch measures.

Twenty students participated initially in the study. One participant was unable to complete the study due to unforeseen circumstances. Therefore, there were a total of 19 participants (one masters of divinity student, one nursing major, one computer science major, one psychology major, one student teacher, two voice music majors, 12 speech-language pathology majors). Ages ranged between 18- 43 years old, and there were four males and 15 females.

Research Hypotheses/Null Hypotheses

Research Hypothesis/Null Hypothesis 1

Research Hypothesis 1

Increased GFI scores and increased jitter scores are dependent

Null Hypothesis 1

Increased GFI scores and increased jitter scores are not dependent.

Research Hypothesis/Null Hypothesis 2

Research Hypothesis 2

There is a significant difference in GFI scores between student teachers/music majors and speech-language pathology majors.

Null Hypothesis 2

There is no significant difference in GFI scores between student teachers/music majors and speech-language pathology majors.

Research Hypothesis/Null Hypothesis 3

Research Hypothesis 3

There is a significant difference in VHQ scores between student teachers/music majors and speech-language pathology majors.

Null Hypothesis 3

There is no significant difference in VHQ scores between student teachers/music majors and speech-language pathology majors.

Research Hypothesis/Null Hypothesis 4

Research Hypothesis 4

There is a significant difference in jitter scores between student teachers/music majors and speech-language pathology majors.

Null Hypothesis 4

There is no significant difference in jitter scores between student teachers/music majors and speech-language pathology majors.

Research Hypothesis/Null Hypothesis 5

Research Hypothesis 5

There is a significant difference in shimmer scores between student teachers/music majors and speech-language pathology majors.

Null Hypothesis 5

There is no significant difference in shimmer scores between student teachers/music majors and speech-language pathology majors.

Materials and Instrumentation

Each student completed the GFI, a symptom index that allows an individual to self-assess the degree to which signs of glottal dysfunction is present. There are 4 items in the assessment that are rated on a scale ranging from 0 (no problem noted) to 5 (severe problem noted). The total can then vary between 0 (asymptomatic) to 20 (severe symptoms noted).

The GFI, found in Appendix A, was chosen because it is a brief and

reproducible assessment that could be paired with other, more objective, measures. It is self-administered and has been considered by research to have “excellent criterion-based and construct validity” (Bach et al., 2005).

Following the GFI, a VHQ was administered. This questionnaire (see Appendix A for sample) was created to assess to what degree habits harmful to the voice were present. Questions related to rest, vocal habits (screaming/yelling, coughing or throat clearing consistently, etc.) diet and medication taken regularly were asked. These questions were based on studies that targeted the aforementioned categories.

For example, N.R. Williams (2003) reviewed occupational groups at risk of voice disorders, specifically teachers, singers, and aerobics instructors. Factors found to contribute to increased numbers in complaints of voice disorders based on the review of studies included: longer classroom hours (length of speaking time), noise levels (speaking in noisy environments), use of dehydrating medications, frequency of shouting, and gender.

Timmermans et al. (2002), looked at smoking prevalence and vocal abuse (yelling, shouting, etc.) in their study analyzing poor voice quality in future and professional voice users. Titze et al. (1997) listed factors that contributed to what they labeled an “abnormal voice”. This included: loud talking, yelling, screaming, hard glottal attacks, singing/speaking outside acceptable physiological range, speaking in a noise environment, excessive coughing and throat clearing, smoking, caffeine, medication, alcohol consumption, and reflux of stomach contents. Studies such as these helped to create the questions that the VHQ is comprised of.

Total score range was from 0 (very good vocal hygiene) to 40 (very poor vocal hygiene). A question asking the number of hours a person uses his or her voice weekly was also included, although not included in the total score. The purpose of this question was to receive further data on each college student participating in the study.

Once both assessments were completed, acoustic measurements were taken using the Visi-Pitch. The Visi-Pitch is a clinical instrumentation tool used for assessment, treatment, and research purposes of communication disorders such as voice, articulation, and accent modification. According to Baken, the Visi-Pitch is a tool widely used by speech-language pathologists (Dwire & McCauley, 1995, p. 156). The tool was chosen for this study because of its popularity amongst professionals in the field in both clinical and research settings over the years (Cox & Selent, 2015; Dwire & McCauley, 1995; Knowlton & Larkin, 2006). Measurements taken included the maximum phonational frequency range, sustained phonation, and jitter and shimmer.

Maximum phonational frequency range is the difference between the lowest pitch and highest pitch a person is capable of producing. Using a microphone, each participant was asked to sustain phonation of the vowel /a/ (“ahh”) at the lowest pitch he or she can make comfortably and gradually move to the highest pitch that can be comfortably made. This was done three times and the trial with the greatest range was recorded. For males, the norms ranged between 80-700 Hz, while for females, norms ranged between 135-1000 Hz (Boone, McFarlane, Von Berg, & Zraick, 2013).

With sustained phonation, typically known as maximum phonation time,

students were asked to sustain the vowel /a/ at a comfortable pitch and loudness level for the longest amount of time possible after maximum inhalation. Sustained phonation is affected by vital capacity, which is in turn affected by age, sex, and stature (Kent, Kent, & Rosenbek, 1987). Three trials were also taken for this measurement and the longest time was recorded for each student. A time of 20 seconds or greater was considered typical for males and females (Boone et al., 2014).

Jitter, measure in percent (%), is the variation in frequency found in a person's voice while shimmer, measured in dB, is the variation in amplitude. To gain these measures, students were asked to sustain phonation for 10-12 seconds. These measures provide objective numbers with normative data to substantiate the level of noise that is present during vocal fold vibration i.e. hoarseness, harshness. A range of .2 – 1.0% in jitter was considered typical for both genders. For shimmer, less than .5 dB was considered the norm (Boone et al., 2014).

The GFI, VHQ, and the acoustic measures from the Visi-Pitch were administered twice during a semester. Pre-testing occurred near the start of the fall semester, while post-testing took place one to three months later. Testing was designed this way to determine any significant changes with voice use and demands of the student's schedules for voice use. See Appendix A for all assessments and questionnaires used in the study.

Statistical Analysis

Data from the assessments and questionnaires were entered into a Microsoft Excel workbook. The first sheet contained pre-and post-data from the VHQ and GFI, including age, gender, major, number of hours of voice use weekly, and scores from

both questionnaires. The second sheet contained pre-and post-measures of each student from the Visipitch, i.e., jitter, shimmer, sustained phonation, and maximum phonational frequency range.

Scores from the VHQ and GFI were converted into decimal numbers for the purpose of analysis. Therefore, for the VHQ, the closer the number reached to 1.00 (same as 40/40), the poorer the student's vocal hygiene. The closer the number reached to 0 (same as 0/40), the better the student's vocal hygiene. Similarly, the closer the number reached to 1.00 in the GFI (same as 20/20), the more severe symptoms appeared to be by the student. The closer the number reached to 0 (same as 0/20), the more asymptomatic the student's voice appeared to be. T-test analyses were conducted on the data gathered with the use of the Statistical Package for the Social Sciences (SPSS).

Another table was created on Microsoft Excel with GFI and jitter scores. Students with scores that increased from pre-testing to post-testing in the GFI and/or jitter were grouped together in this table. These numbers were then either given a 1 to show that the score had increased, or a 0 to show that the score did not increase. Pearson Chi-Square Cross Tabulation via SPSS was then used to analyze the information.

CHAPTER 4

RESULTS

Introduction

The purpose of this study is to provide preliminary data with the aim of determining the vocal health, hygiene, and perceptions of students studying in the college environment specifically in the fields of education, speech-language pathology, and music with an emphasis on the voice. This study focused on the effect of a stressful college environment on the voice during a semester. Pre-and post-tests of the GFI, VHQ, and objective measures (sustained phonation, maximum phonational frequency range, jitter, and shimmer) were given in order to make comparisons between the scores at the beginning and end of the semester. Scores from the GFI and jitter that show an increase from pre-testing to post-testing are also being analyzed to determine dependency between them.

Participants

Nineteen students completed the assessments required for the study. Four of the students were male, while fifteen were female and the age ranged between 18-43 years. Majors represented included speech-language pathology, pre-nursing, psychology: behavioral neuroscience/Spanish studies, computer science, music: voice, vocal performance, visual arts education, and theological seminary. See Table 1 for percentages of the demographic information in this study.

Table 1

Frequencies of Gender, Age, and Majors

	Number of Participants	Percentage of Participants
Gender		
Male	4	(21.05%)
Female	15	(78.95%)
Age		
18-22 (Typical Undergraduate Age)	7	(36.84%)
23+ (Typical Post-Graduate Age)	12	(63.16%)
Majors		
Theological Seminary	1	(5.26%)
Pre-Nursing	1	(5.26%)
Speech-Language Pathology	12	(63.16%)
Psychology: Behavioral	1	(5.26%)
Neuroscience/Spanish Studies		
Computer Science	1	(5.26%)
Music: Voice	1	(5.26%)
Vocal Performance	1	(5.26%)
Visual Arts Education	1	(5.26%)

The demographic presented in Table 1 reflects the diversity in majors, age, and gender represented in the study and are all potential factors for an increased risk of voice disorders based on the literature review.

Variables Description

The variables for this study included the GFI, VHQ, maximum phonational frequency range, sustained phonation, jitter, and shimmer. A pre-and-post-test measurement was completed for each variable.

For the GFI pretest, scores (in decimal form) ranged between .00 and .85. \bar{x} = .17, SD = .25, and the skewness = 1.51. For the GFI posttest, scores ranged between

.00 and .65. $\bar{x} = .13$, $SD = .18$, and the skewness = 2.10.

For the VHQ pretest, scores ranged between .13 and .40. $\bar{x} = .23$, $SD = .078$ and the skewness = .84. For the posttest, scores ranged between .10 and .40. $\bar{x} = .25$, $SD = .07$, and the skewness = -.14.

Pretest scores for jitter ranged between .18 and 2.93. $\bar{x} = 1.37$, $SD = .77$, and the skewness = .82. Posttest scores ranged between .30 and 2.26. $\bar{x} = 1.21$, $SD = .63$, and the skewness = .064.

Pretest scores for shimmer ranged between .12 and .74. $\bar{x} = .29$, $SD = .13$, and the skewness = 2.28. Posttest scores ranged between .02 and .38. $\bar{x} = .25$, $SD = .09$, and the skewness = -.99. Table 2 shows the descriptive statistics for the variables discussed.

Differences between pre-and-post-test scores were also analyzed and compared. For the GFI, the range was -.25 to .80. $\bar{x} = .05$, $SD = .24$, and the skewness = 2.00. The range for the VHQ was -.15 to .10. $\bar{x} = -.02$, SD was .06, and the skewness = .02. For jitter measurements, the range was -1.47 to 2.19. $\bar{x} = .15$, $SD = .98$, and the skewness = .29. Finally, the range for shimmer measurements was -.12 to .46. $\bar{x} = .04$, $SD = .14$, and the skewness = 1.77. See Table 3 for further information.

Hypotheses Testing

Five hypotheses were used to answer the research questions presented in this study. Pearson Chi-Square Cross Tabulation was used to analyze the increase in Glottal Function Index scores from pre-testing to post-testing and jitter measurements from pre-testing to post-testing. An independent-samples t-test was also conducted to compare scores between two groups to determine significant difference. Based on the

Table 2

Descriptive Statistics of Variables

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
GFI Pre	19	.00	.85	.17	.25	1.51	.52
GFI Post	19	.00	.65	.13	.18	2.10	.52
VHQ Pre	19	.13	.40	.23	.08	.84	.52
VHQ Post	19	.10	.40	.25	.07	-.14	.52
JITTER	19	.18	2.93	1.37	.77	.82	.52
Pre							
JITTER	19	.30	2.26	1.21	.63	.06	.52
Post							
SHIMME	19	.12	.74	.29	.13	2.28	.52
R Pre							
SHIMME	19	.02	.38	.25	.09	-.99	.52
R Post							
Valid N	19						
(listwise)							

Table 3

Descriptive Statistics for Differences in Pre- and Post-Test Scores

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
GFI Diff	19	-.25	.80	.04	.24	2.00	.52
VHQ Diff	19	-.15	.10	-.02	.06	.02	.52
JITTER	19	-1.47	2.19	.15	.98	.29	.52
Diff							
SHIMMER	19	-.12	.46	.04	.14	1.77	.52
Diff							
Valid N	19						
(listwise)							

findings, the hypotheses accepted were as follows.

Hypothesis 1

Null Hypothesis 1

Increased GFI scores and increased jitter scores are not dependent. Scores that increased from pre-testing to post-testing in either the GFI, jitter measures, or both were grouped and analyzed using Pearson Chi-Square Cross Tabulation. Eleven of the nineteen students matched this criterion. See Table 4 for a visual representation of this information.

Table 4

*Crosstabulation – GFI Change * Jitter Change*

		Jitter Change		Total
		.00	1.00	
GFI Change	.00	4	2	6
	1.00	3	2	5
Total		7	4	11

Note. .00 = no increase in score; 1.00 = increase in score

A chi-square of independence was performed to examine the relation between increased GFI scores and increased jitter scores. The relation between these variables was not significant ($df = 1$, Asymp. Sig. = .819). See Table 5 for further information.

Table 5

Chi-Square Tests

	Value	<i>df</i>	Asymp. Sig. (2-sided)	Exact Sig. (2- sided)	Exact Sig. (1- sided)
Pearson Chi-Square	.05 ^a	1	.82		
Continuity Correction ^b	.00	1	1.00		
Likelihood Ratio	.05	1	.82		
Fisher's Exact Test				1.00	.652
Linear-by-Linear Association	.05	1	.83		
N of Valid Cases	11				

Note. a. 4 cells (100%) have expected count less than 5. The minimum count is 1.82.
b. Computed only for a 2x2 table.

Hypothesis 2

Null Hypothesis 2

There is no significant difference in GFI scores between student teachers/music majors and speech-language pathology majors. The first group consisted of the three students from the sample who fit the label of student teachers/music majors (music: voice, vocal performance, and visual arts education majors). The second group consisted of the 12 speech-language pathology students.

Results of independent samples t-test report no significant difference in the scores for speech-language pathology students and student teachers/music majors for the GFI ($t = .1.07$, $df = 4.61$ $\bar{x} = .15$, and Sig. = .42).

Hypothesis 3

Null Hypothesis 3

There is no significant difference in VHQ scores between student teachers/music majors and speech-language pathology majors. The first group consisted of the three students from the sample who fit the label of student teachers/music majors (music: voice, vocal performance, and visual arts education majors). The second group consisted of the 12 speech-language pathology students.

Results of independent samples t-test report no significant difference in the scores for speech-language pathology students and student teachers/music majors for the VHQ ($t = -1.22$, $df = 13$, $\bar{x} = -.06$, and $\text{Sig.} = .32$).

Hypothesis 4

Null Hypothesis 4

There is no significant difference in jitter scores between student teachers/music majors and speech-language pathology majors. The first group consisted of the 3 students from the sample who fit the label of student teachers/music majors (music: voice, vocal performance, and visual arts education majors). The second group consisted of the 12 speech-language pathology students.

Results of independent samples t-test report no significant difference in the scores for speech-language pathology students and student teachers/music majors for jitter ($t = .62$, $df = 12.15$, $\bar{x} = .22$, and $\text{Sig.} = .55$).

Hypothesis 5

Null Hypothesis 5

There is no significant difference in shimmer scores between student teachers/music majors and speech-language pathology majors. The first group consisted of the three students from the sample who fit the label of student teachers/music majors (music: voice, vocal performance, and visual arts education majors). The second group consisted of the 12 speech-language pathology students.

Results of independent samples t-test reported no significant difference in the scores for speech-language pathology students and student teachers/music majors for shimmer ($t = -1.26$, $df = 5.77$, $\bar{x} = -.08$, and $\text{Sig.} = .256$).

Summary

The purpose of this study is to determine the vocal health, hygiene, and perceptions of students studying in the college environment specifically in the fields of education, speech-language pathology, and music with an emphasis on the voice. As a result, 19 students were assessed using the GFI, VHQ, and objective measures of maximum phonational frequency range, sustained phonation, jitter, and shimmer.

Following pre-and-post-testing, GFI and jitter scores that showed an increase following post-testing were analyzed using Pearson Chi-Square Crosstabulation. Two groups, the 12 speech-language pathology majors, and the three student teachers/music voice majors were also analyzed using independent samples t-test. Both tests were ran using SPSS.

Results of the chi-square test of independence reported that the relation between the increased GFI scores and the increased jitter scores were not significant.

Results of independent samples t-test reported no significant difference in the scores for speech-language pathology students and student teachers/music majors for GFI, VHQ, jitter, or, shimmer. The significance of these results will be discussed in the following chapter.

CHAPTER 5

SUMMARY, DISCUSSION, AND CONCLUSION

Introduction

The purpose of this study is to provide preliminary data with the aim of determining the vocal health, hygiene, and perceptions of students studying in the college environment specifically in the fields of education, speech-language pathology, and music with an emphasis on the voice. It is believed that many students within these fields do suffer from voice concerns while in the college setting. Findings from this study would suggest a further need for vocal hygiene education as part of the curriculum.

Research Problem

There are many college/university students studying to become teachers, professional singers, and speech-language pathologists. Yet, despite research available on the risk of developing voice disorders in these areas of study, very little was found on such individuals while in the college setting. This is particularly true for speech-language pathologists who have limited research available overall.

Methodology

Nineteen students between the ages of 18- 43 years old, completed pre-and-post-testing of the GFI, VHQ, and the objective measures including maximum

phonational frequency range, sustained phonation, jitter, and shimmer. Students were from a variety of majors and testing was completed over a period of one to three months.

Following the assessments, data was gathered and organized using Microsoft Excel. Pearson Chi-Square Crosstabulation was used to analyze the increase in GFI and jitter scores of 11 students. Independent samples t-test was used to analyze the difference in GFI, VHQ, jitter and shimmer scores of 15 students (12 speech-language pathology majors and three student teachers/music majors). All analysis was conducted using SPSS.

Results

A chi-square of independence was performed to examine the relation between increased GFI scores and increased jitter scores. The results showed that the relationship between these scores is not significant (Sig. = .84).

The independent samples t-test results also showed that there is no significant difference between student teachers/music majors and speech-language pathology majors in GFI scores (Sig. = .34), VHQ scores (Sig. = .32), jitter scores (Sig. = .55), or shimmer scores (Sig. = .26).

Discussion

Previous studies show that practices such as speaking in loud background noise, prolonged voice use, and using an injured voice before it has had time to recover, all increase the risk of developing voice disorders in teachers and singers (Morrow & Connor, 2011; Franca & Wagner, 2014). While more research is still

needed, especially in the college setting, extensive research has been conducted on both groups. However, the amount of research found on speech-language pathologists both in the field and in the college setting, is greatly limited.

In the present study, it was found that the increased GFI scores and increased jitter scores were not dependent when analyzed with Pearson Chi-Square Crosstabulation. An increase in scores for the GFI would suggest that person has a high self-perception of glottal dysfunction. An increase in jitter scores typically suggests voice pathology, and symptoms such as hoarseness and breathiness are more likely to be present. Findings from this study would mean that having an increase in the GFI score does not affect the increase of a jitter score in an individual. However, due to the small sample size it is not possible to say this for sure. A larger sample size is needed in order to determine whether increased GFI scores and increased jitter scores are dependent.

Similarly, with the independent samples t-test analysis, when pre-and post-scores of GFI, VHQ, jitter, and shimmer were compared between the speech-language pathology major group and the music major/student teacher group, there was no significant difference. This means that scores recorded from the assessments administered were unable to distinguish one group from another. Since the research has shown that teachers and singers, both students and professionals alike, have a high risk for developing voice disorders, high scores in the assessments used in this study were predicted for the music major/student teacher group. While only one article on speech-language pathology majors was found to suggest risk of developing voice disorders, the theory was that scores would still be lower in comparison to the

music major/student teacher group. This is due to the education of voice disorders and vocal hygiene taught to this specific group, and the assumption that with treating others with voice disorders, speech-language pathologists would take care of their own voices to minimize risk of vocal damage. The fact that scores could not be distinguished from one another by groups, suggests that students with higher scores could potentially be found in any group, including the speech-language pathology major group.

However, likewise with the previous test, a small sample size greatly affects the accuracy of these findings. In order to determine true significance, the sample size would need to be larger. There would also need to be a more equal distribution for the experimental and control groups.

Despite not finding any significance in any of the testing administered, it was observed that a large number of results from the objective and subjective measures were considered out of norms within both groups. This further suggests that there are signs of vocal issues found not only among music majors and student teachers, but speech-language pathology majors as well.

Conclusion and Recommendations

Few conclusions can be made due to the small sample of this study and the results being not significant. However, based on the observation that at least one score was considered to be out of norms for the majority of participants across all groups, it can be suggested that at least in this population voice is being impacted regardless of major. This would further suggest that speech-language pathologists, student teachers, and student singers are all at risk of developing vocal pathology

(vocal nodules, vocal polyps, redness, swelling and edema of the laryngeal area) due to overuse of the voice and the lack of practice in taking care of the voice (i.e. drinking water, reducing yelling and screaming, etc.). However, due to the small sample size present in this study further research is needed to determine whether speech-language pathologists are as greatly affected by these risks as singers and/or music majors.

Several limitations were noted in this study. Firstly, results were affected due to the small, unbalanced sample size. Therefore, it cannot yet be determined through this study if scores between these two groups would be significant or not. This concern also affects the ability to determine if increased GFI scores and increased jitter scores are dependent. Further studies with a larger, more balanced sample size are needed.

Another concern is the consistency in how procedures were implemented. Pre- and post-testing took one to three months to be completed due to time constraints found during the study. This means that findings could also have been affected due to the inconsistency of time between the tests administered. In the future, it is recommended that a more specific length of time is maintained when completing the pre- and post-testing for data collection.

All participants in the study attended the same university. Therefore, it might be beneficial to have more universities participate in the study. This would not only aid in increasing the sample size, but also increase the variety of students within the sample.

There are also a few suggestions for future studies that could be implemented.

One such example is to observe whether or not implementing vocal hygiene education as part of the curriculum would improve vocal health of students within these groups.

There are other groups not mentioned within this study that could be identified as occupational voice users and could be observed in the college setting. One such example is theology majors as authors Middleton and Hinton (2009) state that female pastors in particular are considered “heavy occupational voice users” and are therefore at risk for developing voice disorders. Observing theology majors, who are required to participate in public speaking at some point during their program, is another suggestion for a study.

As previously mentioned, teachers and singers have been found to have a high risk of developing voice disorders. Research has found this to be true for students studying these professions as well. Nevertheless, speech-language pathologists also are at risk of developing voice issues at both the professional and pre-professional level. The extent of which this group is affected has yet to be discovered. Further research is needed to determine the degree to which speech-language pathologists are affected in terms of voice usage, vocal healthy habits and prevalence of voice disorders.

APPENDIX A

QUESTIONNAIRES AND ASSESSMENTS

Glottal Function Index

Within the last MONTH, How did the Following Problems Affect You?	0 = No Problem 5 = Severe Problem					
1. Speaking Took Extra Effort	0	1	2	3	4	5
2. Throat Discomfort or Pain After Using Your Voice	0	1	2	3	4	5
3. Vocal Fatigue (Voice Weakened as You Talked)	0	1	2	3	4	5
4. Voice Cracks or Sounds Different	0	1	2	3	4	5
	Total (0-20)					

Vocal Hygiene Questionnaire

Age _____

Gender Male Female

Major _____

Approximately how many hours a week did you use your voice in the past month? _____

How many hours a night do you sleep? 6-8 4-5 Less than 4

How many glasses of water do you drink daily? 8-10 5-7 Less than 5

Do you smoke? No Occasionally Yes

Do you drink alcohol? No Occasionally Yes

Do you frequently eat or drink any of the following (3 or more days weekly)?

No Yes

Citrus Fruits/Juices (Orange juice, Grapefruit, etc.)
Soda
Chocolate
Spicy Food
Fried Food
Coffee

How frequently do you perform any of the following actions?

Yelling/Screaming
Never Occasionally Frequently

Throat Clearing
Never Occasionally Frequently

Coughing
Never Occasionally Frequently

Loud talking
Never Occasionally Frequently

Talking in noisy situations (social gatherings, restaurants, sports events, concerts, etc.)
Never Occasionally Frequently

Whispering

Never Occasionally Frequently

Singing without warming up the voice

Never Occasionally Frequently

Talking for prolonged periods of time

Never Occasionally Frequently

Do you frequently use any of the following types of medicine (3 or more days weekly)?

No

Yes

Anti-histamines (allergy medications)

Anti-depression/anxiety medications

Anticholinergics (asthma medications)

Antihypertensive (blood pressure medication)

Anticoagulants (blood thinners)

Oral contraceptives

Diuretics

Muscle relaxants

How often do you experience Gastroesophageal Reflux Disease/Laryngopharyngeal Reflux (GERD/LR)?

Never Occasionally Frequently

Total Score = /40

Visipitch Acoustic Measures

Acoustic Measures	Norms	
	Males	Females
Maximum Phonational Frequency Range	80 - 700 Hz	135 – 1000 Hz
Jitter	.2 – 1.0%	.2 – 1.0%
Shimmer	<.5 dB	<.5 dB
Sustained Phonation	20 seconds	20 seconds

Gender

Maximum Phonational Frequency Range

Jitter

Shimmer

Sustained Phonation

REFERENCE LIST

- American Speech-Language-Hearing Association. (n.d.). About the American Speech-Language-Hearing Association (ASHA). Retrieved from <http://www.asha.org/about/>
- American Speech-Language-Hearing Association. (n.d.). *Vocal Cord Nodules and Polyps*. Retrieved from <http://www.asha.org/public/speech/disorders/NodulesPolyps/>
- American Speech-Language-Hearing Association. (1993). *Definitions of communication disorders and variations* [Relevant Paper]. Retrieved from www.asha.org/policy.
- American Speech-Language-Hearing Association. (2005). *The use of voice therapy in the treatment of dysphonia* [Technical Report]. Retrieved from www.asha.org/policy.
- Anderson, L., Baylor, C. R., Eadie, T. L., & Yorkston, K. M. (2016). Describing speech usage in daily activities in typical adults. *Journal of Voice, 30*(1), 42-52. doi:10.1016/j.jvoice.2015.02.001
- Bach, K. K., Belafsky, P. C., Wasylik, K., Postma, G. N., & Koufman, J. A. (2005). Validity and reliability of the glottal function index. *Archives of Otolaryngology–Head & Neck Surgery, 131*(11), 961-964. doi:10.1001/archotol.131.11.961
- Boone, D. R., McFarlane, S. C., Von Berg, S. L., & Zraick, R. I. (2013). *The voice and voice therapy*. Boston, MA: Pearson.
- Braun-Janzen, C., & Zeine, L. (2009). Singers' interest and knowledge levels of vocal function and dysfunction: Survey findings. *Journal of Voice, 23*(4), 470-483. doi:10.1016/j.jvoice.2008.01.001
- Broadus-Lawrence, P. L., Treole, K., McCabe, R. B., Allen, R. L., & Toppin, L. (2000). The effects of preventive vocal hygiene education on the vocal hygiene habits and perceptual vocal characteristics of training singers. *Journal of Voice, 14*(1), 58-71. doi:10.1016/s0892-1997(00)80095-8
- Cohen, J. T., Oestreicher-Kedem, Y., Fliss, D. M., & Derowe, A. (2007). Glottal function index: A predictor of glottal disorders in children. *Annals of Otolaryngology, Rhinology & Laryngology, 116*(2), 81-84. doi:10.1177/000348940711600201

- Cohen, S. M., Jacobson, B. H., Garrett, C. G., Noordzij, J. P., Stewart, M. G., Attia, A., . . . & Cleveland, T. F. (2007). Creation and validation of the singing voice handicap index. *Annals of Otolaryngology, Rhinology & Laryngology*, *116*(6), 402-406. doi:10.1177/000348940711600602
- Cox, V. O., & Selent, M. (2015). Acoustic and respiratory measures as a function of age in the male voice. *Journal of Phonetics & Audiology*, *1*(1), 1-7. doi:10.4172/2471-9455.1000105
- Donahue, E. N., Leborgne, W. D., Brehm, S. B., & Weinrich, B. D. (2014). Reported vocal habits of first-year undergraduate musical theater majors in a preprofessional training program: A 10-year retrospective study. *Journal of Voice*, *28*(3), 316-323. doi:10.1016/j.jvoice.2013.11.011
- Dwire, A., & Mccauley, R. (1995). Repeated measures of vocal fundamental frequency perturbation obtained using the Visi-Pitch. *Journal of Voice*, *9*(2), 156-162. doi:10.1016/s0892-1997(05)80249-8
- Farrús, M., Hernando, J., & Ejarque, P. (2007). Jitter and shimmer measurements for speaker recognition. *TALP Research Center, Department of Signal Theory and Communications*, 1-4.
- Franca, M. C., & Wagner, J. F. (2015). Effects of vocal demands on voice performance of student singers. *Journal of Voice*, *29*(3), 324-332. doi:10.1016/j.jvoice.2014.07.004
- Gaskill, C. S., Williams, M. B., & Mchugh, R. K. (2015). Singers and steroids: A multi-disciplinary discussion. *Perspectives on Voice and Voice Disorders*, *25*(1), 16. doi:10.1044/vvd25.1.16
- Gottliebson, R. O., Lee, L., Weinrich, B., & Sanders, J. (2007). Voice problems of future speech-language pathologists. *Journal of Voice*, *21*(6), 699-704. doi:10.1016/j.jvoice.2006.07.003
- Guerra, J., Loiola, C., Ghirardi, A., & Ferreira, L. (2013). Relationship between vocal symptoms in college students and their possible causes. *International Archives of Otorhinolaryngology*, *16*(03), 306-312. doi:10.7162/s1809-97772012000300002
- Hunter, E. J., Tanner, K., & Smith, M. E. (2011). Gender differences affecting vocal health of women in vocally demanding careers. *Logopedics Phoniatrics Vocology*, *36*(3), 128-136. doi:10.3109/14015439.2011.587447

- Hunter, E. J., & Titze, I. R. (2010). Variations in intensity, fundamental frequency, and voicing for teachers in occupational versus nonoccupational settings. *Journal of Speech, Language, and Hearing Research*, 53(4), 862-875.
- Kent, R. D., Kent, J. F., & Rosenbek, J. C. (1987). Maximum performance tests of speech production. *Journal of Speech and Hearing Disorders*, 52(4), 367-387.
- Keung, C., & Hebbard, G. (2016). The management of gastro-oesophageal reflux disease. *Australian Prescriber*, 39(1), 6-11.
- Knowlton, G. E., & Larkin, K. T. (2006). The influence of voice volume, pitch, and speech rate on progressive relaxation training: Application of methods from speech pathology and audiology. *Applied Psychophysiology and Biofeedback*, 31(2), 173-185. doi:10.1007/s10484-006-9014-6
- Merrill, R. M., Tanner, K., Merrill, J. G., Mccord, M. D., Beardsley, M. M., & Steele, B. A. (2013). Voice symptoms and voice-related quality of life in college students. *Annals of Otolaryngology, Rhinology & Laryngology*, 122(8), 511-519. doi:10.1177/000348941312200806
- Middleton, R. L., & Hinton, V. A. (2009). A preliminary investigation of the vocal behaviors and characteristics of female pastors. *Journal of Voice*, 23(5), 594-602. doi:10.1016/j.jvoice.2008.01.002
- Morawska, J., Niebudek-Bogusz, E., Zaborowski, K., Wiktorowicz, J., & Śuwińska-Kowalska, M. (2015). V-RQOL as a tool for assessing the impact of voice disorders on the quality of life in occupational voice users. *Otorinolaryngologia*, 14(2), 96-103.
- Morrow, S. L., & Connor, N. P. (2011). Comparison of voice-use profiles between elementary classroom and music teachers. *Journal of Voice*, 25(3), 367-372. doi:10.1016/j.jvoice.2009.11.006
- Munier, C., & Farrell, R. (2016). Working conditions and workplace barriers to vocal health in primary school teachers. *Journal of Voice*, 30(1). doi:10.1016/j.jvoice.2015.03.004
- Murry, T., Zschommler, A., & Prokop, J. (2009). Voice handicap in singers. *Journal of Voice*, 23(3), 376-379. doi:10.1016/j.jvoice.2007.10.013
- Nanjundeswaran, C., Jacobson, B. H., Gartner-Schmidt, J., & Abbott, K. V. (2015). Vocal fatigue index (VFI): Development and validation. *Journal of Voice*, 29(4), 433-440. doi:10.1016/j.jvoice.2014.09.012

- Phyland, D. J., Oates, J., & Greenwood, K. M. (1999). Self-reported voice problems among three groups of professional singers. *Journal of Voice, 13*(4), 602-611. doi:10.1016/s0892-1997(99)80014-9
- Rosen, C. A., & Murry, T. (2000). Voice handicap index in singers. *Journal of Voice, 14*(3), 370-377. doi:10.1016/s0892-1997(00)80082-x
- Roy, N., Merrill, R. M., Thibeault, S., Parsa, R. A., Gray, S. D., & Smith, E. M. (2004). Prevalence of voice disorders in teachers and the general population. *Journal of Speech Language and Hearing Research, 47*(2), 281-293. doi:10.1044/1092-4388(2004/023)
- Simberg, S., Sala, E., Laine, A., & Rönnemaa, A. (2001). A fast and easy screening method for voice disorders among teacher students. *Logopedics Phoniatrics Vocology, 26*(1), 10-16. doi:10.1080/140154301300109062
- Simberg, S., Sala, E., Vehmas, K., & Laine, A. (2005). Changes in the prevalence of vocal symptoms among teachers during a twelve-year period. *Journal of Voice, 19*(1), 95-102. doi:10.1016/j.jvoice.2004.02.009
- Smith, E., Kirchner, H. L., Taylor, M., Hoffman, H., & Lemke, J. H. (1998). Voice problems among teachers: Differences by gender and teaching characteristics. *Journal of Voice, 12*(3), 328-334. doi:10.1016/s0892-1997(98)80022-2
- Snyder, T. D., de Brey, C., & Dillow, S. A. (2016). Digest of education statistics 2014, NCES 2016-006. *National Center for Education Statistics*. Retrieved from <http://files.eric.ed.gov/fulltext/ED565675.pdf>
- Teixeira, J. P., Oliveira, C., & Lopes, C. (2013). Vocal acoustic analysis – jitter, shimmer and hnr parameters. *Procedia Technology, 9*, 1112-1122. doi:10.1016/j.protcy.2013.12.124
- Thomas, G., Kooijman, P. G., Cremers, C. W., & Jong, F. I. C. R. S. (2005). A comparative study of voice complaints and risk factors for voice complaints in female student teachers and practicing teachers early in their career. *Eur Arch Otorhinolaryngol European Archives of Oto-Rhino-Laryngology, 263*(4), 370-380. doi:10.1007/s00405-005-1010-6
- Thomas, G., Kooijman, P. G., Donders, A. R., Cremers, C. W., & Jong, F. I. (2007). The voice handicap of student-teachers and risk factors perceived to have a negative influence on the voice. *Journal of Voice, 21*(3), 325-336. doi:10.1016/j.jvoice.2005.12.003

- Timmermans, B., Bodt, M. D., Wuyts, F., Boudewijns, A., Clement, G., Peeters, A., & Heyning, P. V. (2002). Poor voice quality in future elite vocal performers and professional voice users. *Journal of Voice, 16*(3), 372-382. doi:10.1016/s0892-1997(02)00108-x
- Titze, I. R., Lemke, J., & Montequin, D. (1997). Populations in the U.S. workforce who rely on voice as a primary tool of trade: A preliminary report. *Journal of Voice, 11*(3), 254-259. doi:10.1016/s0892-1997(97)80002-1
- Verdolini, K., & Ramig, L. O. (2001). Review: Occupational risks for voice problems. *Logopedics Phoniatics Vocology, 26*(1), 37-46. doi:10.1080/140154301300109125
- Watson, V. M. (1998). The teaching voice: Problems and perceptions. *Logopedics Phoniatics Vocology, 23*(3), 133-139. doi:10.1080/140154398434158
- Williams, N. R. (2003). Occupational groups at risk of voice disorders: A review of the literature. *Occupational medicine, 53*(7), 456-460. doi:10.1093/occmed/kqg113
- Wilson, P. H. (2013). Actors, singers, real jobs and 'day jobs': A meta-analysis of occupational voice health hazards. 8th International Congress of Voice Teachers, 2013 Brisbane, Australia. *International Congress of Voice Teachers, 251*, 237-243.

