April 2020

Vocal Health of Choral Singers from Kenya and the United States: Dysphonia and Vocal Fatigue in Relation to Musical Genres

Morgan Jolley Burburan
University of South Florida

Vocal Health of Choral Singers from Kenya and the United States:

Dysphonia and Vocal Fatigue in Relation to Musical Genres

by

Morgan Jolley Burburan

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy in Music
Concentration in Music Education
School of Music
College of the Arts
University of South Florida

Major Professor: C. Victor Fung, Ph.D.
Lynne Gackle, Ph.D.
Janet L.S. Moore, Ed.D.
David A. Williams, Ph.D.

Date of Approval:
January 31, 2020

Keywords: vocalist, sing, vocal lesions, choir, CCM, traditional folk, vernacular music, popular music, non-Western, music, physiology, vocal load, pathology, training, vocal hygiene, EASE, VFI, SVHI, CAPE-V, VoxMetria, critical pedagogy

I dedicate this dissertation to my husband Eric;

children Katherine, Niko, and Conner;

and to my mother Marvel Mayfield and aunt Brenda Zoby.

I could not have done this without all of your love, support, and encouragement.

To God be the Glory! Psalm 13:5-6

Acknowledgements

I would like to additionally thank the following people, without whom I would not have achieved this goal. To my committee chair, Dr. Victor Fung, who has tirelessly supported my endeavors with a quiet calm that has simultaneously challenged and inspired me. You are a consummate professional, and everything that you do and say is motivated by kindness, intellectual curiosity, and respect. Dr. David Williams, thank you for not only challenging me to think outside the box, but for helping me to understand that there need not be a box. You have opened my eyes to see more students, and have shown me better ways of serving them, and it has impacted so many as a result. Thank you to Dr. Janet Moore for your warmth, for always checking in on me, and for helping me to think through obstacles and circumstances with a different lens. Dr. Lynne Gackle, thank you for inspiring me for the past 26 years, and for mentoring me since 2004. You have been my professional and personal role model, and it is you who inspired me to be the educator and conductor that I am today.

Thank you to Dr. Kevin Fenton and to Ken Wakia for supporting my vision for this study, for working with me to overcome the complicated logistics, and for making accommodations to your rehearsal schedule and repertoire selection in order to allow for this research to take place. You are both exceptional educators, conductors, and humanitarians, and have made such an impact on my life. AV4P (A Voice 4 Peace) has transformed my teaching, and has inspired both myself and my students as well as countless others. I feel fortunate to call both of you friends as well as colleagues and mentors. Thank you to the ensemble members of both the Nairobi Chamber Chorus and the Festival Singers of Florida for participating in this

seminal research, for sharing your rehearsal time with me, and for your openness and vulnerability regarding this sensitive topic for vocalists. You made this research possible, and as a result many others will benefit from your transparency.

Asante sana to those in Kenya that welcomed me so warmly, making me feel that Kenya was my second home! To Ken and Jo Wakia for inviting me as a guest during my stay in Nairobi, to Leonard Wekesa, Mark Onyango, Sylvester Otieno, and Noah Ochomo for allowing me to observe and work with your students, and to Evans Mbinji Obanda for taking the time to explain the intricacies of the Kenya National Music Festival, and for answering my many questions. Additional thanks to Leonard Wekesa and the Kenyan National Music Festival officials for allowing me to observe a portion of the festival, to Dr. Emily Akuno for graciously sharing insight on this topic based on your formidable experience and research, and to Sylvester Otieno or "Shujaa" for bringing some of the joy, love, and music of Kenya to my students and I at USF!

Thank you to the teachers, professors, and mentors along the way who sparked curiosity, helped me to develop a growth mindset, and nurtured whatever potential that you saw in me, especially Ronald Burrichter, Dr. Brenda Smith, Dr. Judy Bowers, Dr. Kevin Fenton, Dr. Andre Thomas, Dr. Clifford Madsen, Dr. Victor Fung, Dr. David Williams, Dr. Lynne Gackle, Dr. Clint Randles, and Dr. Jennifer Bugos. Thank you to Mary Pyfrom and Dr. Supraja Anand for thoroughly helping me to learn the intricacies of the vocal mechanism and my own voice! Thank you to my Ph.D. cohort at the University of South Florida Patrick Cooper and Danxu Ma for inspiring me to be a better student, and to Jason Sivill, Dean Spaulding, Lodi Roher, and Ebony Perez for the many hours spent helping me to "clear the fog" regarding statistics!

My deep appreciation and love go to Allison Penn, Paul Castelli, Brittany Smith, Gina Lalane, Larkie Fleming, Traci Ruiz, Micah Hester, Randi Olsen, Holly Collins, Marcel Napalitano, Cari Smith, Wesley Roy, Evan Powers, Heidi Thompson, Erin Castelli, and to all of my family, friends, and Crosspoint family for your love, understanding, encouragement, and constant support during this long process. The phone calls, text messages, encouraging words, prayers, and acceptance of my peculiarities, busyness, and stress have been so appreciated. Like Aaron did for his brother Moses, you figuratively held my arms up for me when I was too tired to lift them myself. Thank you to my colleagues, and to my students, both former and current, for inspiring me to want to become a better educator so that I might serve your education to the best of my ability. You are the reason that I pursued education, and I hope that you likewise will pour into future generations and continue to "be the change."

To my aunt Debbie Bloom, thank you for your constant support and sacrifice to be there for my family while I have been pursuing this dream, and for all of the times that you drove my children somewhere on my behalf. To my aunt Brenda Zoby and uncle Billy, thank you for letting me bounce ideas, for your guidance, for serving as my editor-in-chief, and for allowing me to have dissertation sanctuary time at "the brown house." You provided a place of peace and tranquility so that I might find success, and cared for my every need while there, and I am very grateful. To my mother Marvel Mayfield, there aren't enough words to thank you. Your intellect and strength inspire me; you are truly the smartest person that I know. In overcoming past struggles, you modeled the phrase "be the change" and are the reason that this phrase is one of my life mottos. Thank you for being my biggest fan, and for our daily talks about every single aspect of my life.

To my children Katherine, Nikolai, and Conner, and my brother-in-law who is almost like a son, Trevor. I re-launched my educational career when you were six, three, and one respectively, and Trevor was fourteen. You all have grown up watching me go from being an undergraduate student, to a Master's student, and now a Ph.D. student. Most of those years I was simultaneously teaching for 10-16 hours per day. You have sacrificed much so that I could pursue education, understanding when I had work to do, late nights, early mornings, hours staring into a computer screen, the weeks away for performances and conferences, and all the while you were cheering me on. I hope that you know that you can do anything that you want in life, and that my story impresses upon you that hard work pays off, that your circumstances don't have to define you, and that it is never too late to pursue education. Thank you for being you, and for being the reason that I began this journey while also being my motivation for finishing it. I love you all.

No one has sacrificed or loved me more than my husband, Eric. Thank you for not only putting up with me, but for being a rock on the good days and the bad. Thank you for your steadfast support, for working the extra details in order to support us, for caring for our home and children, for the cooking, laundry, cleaning, and lawn work, and for still having the energy to listen to my stories at night. Thank you for understanding that for hours, days, weeks, and even months at a time that I had to work incessantly, for watching movies by yourself, and for constantly checking on me to see if I needed anything, giving me a quick kiss of encouragement. Thank you for all that you did to make this possible.

Thank you to my Lord for providing light when the path seemed dark, and for allowing my mess to become your message.

Galatians 6:14; Psalm 33:3

Table of Contents

List of Tables

List of Figures

Abstract

The purpose of this mixed-methods study was to investigate the vocal health of choral singers from Kenya and the United States and to determine whether genre (classical choral, traditional Kenya, and Contemporary Commercial Music [CCM]) had any impact on healthy vocal production, particularly as it related to vocal fatigue. Participants were adult singers (N = 94) in two semi-professional choirs, the Nairobi Chamber Chorus (NCC) from Kenya (n = 25) and the Festival Singers of Florida (FSOF) from the United States (n = 69). Singers' perceived overall vocal health was measured using multiparametric clinical self-reporting instruments and acoustical assessment. Singers' level of dysphonia was assessed using the Singing Voice Handicap Index (SVHI) (Cohen *et al.*, 2007), and the overall speaking voice was assessed using the Voice Fatigue Index (VFI) (Nanjundeswaran *et al.*, 2015) which measured both vocal fatigue and potential pathology in the vocal mechanism. VoxMetria (1.0.7, CTS Informática, Pato Branco, Paraná, Brazil) was used as an acoustical assessment to provide further analysis of the quality of each participants' voice by measuring Irregularity (jitter and shimmer) and Glottal-to-Noise Excitation (GNE). Singers' vocal fatigue while singing various genres was assessed with the self-reporting Ability to Sing Easily (EASE) (Phyland *et al*, 2013) while employing the stylistic techniques performed in varying genres including Western choral music, traditional folk choral music, and choral genres within the realm of CCM. Singers also completed a questionnaire which provided demographic information, vocal training, genres performed, physiological aspects of the voice, vocal loading and hygiene behaviors, and a medical

background as it pertains to their vocal health. This study also included interviews of four music educators from within each ensemble, selected using a stratified randomization process. Those interviewed had their voices analyzed using the CAPE-V analysis (ASHA, 2006).

Quantitative results indicated that participants from both ensembles were vocally healthy overall as it related to their speaking and singing voices. Participants from FSOF expressed concern regarding their own vocal dysphonia, but all dysphonia measures indicated overall vocal health. Participants from NCC expressed less concern regarding personal dysphonia. While both groups were within the normal ranges for SVHI and VFI 2 scores measuring physical discomfort, NCC participants were significantly higher than FSOF participants. Irregularity (i.e., jitter and shimmer) scores were significantly higher in NCC singers than FSOF participants, indicating dysphonia. GNE scores for both ensembles were within the normal range, though FSOF participants showed significantly higher scores, indicating less breathiness in the tone, which is considered healthier. Results from the singer questionnaire indicated that aspects of vocal training, physiology, vocal loading, vocal hygiene, genres performed, and pathology within the vocal mechanism played a significant role in predicting the overall health of singers. Both ensembles had a high percentage of music teachers (NCC 40%, FSOF 88%). There was not a significant difference between music teachers and non-music teachers as it related to ensemble in overall vocal health. Regarding effect of genre on vocal fatigue as measured by the EASE, both choirs became less fatigued as they sang through the three genres (traditional and contemporary choral, CCM choral music, and folk and traditional folk music). FSOF was significantly less fatigued than NCC participants after 106 minutes of singing. Regarding genre, NCC participants' fatigue increased when singing CCM choral music, and then significantly decreased when singing traditional folk music from Kenya and other African nations.

Qualitative results indicated that participants from both NCC and FSOF had a similar understanding regarding the definition of healthy singing, though members from NCC focused primarily on concerns regarding range, endurance and avoiding undue strain and FSOF participants focused more on tension free, supported, and resonant singing. Music educators in both choirs highly valued singing in multiple genres and chose repertoire accordingly. They discussed various vocal techniques used when singing across genres. Music educators from NCC sang very differently when using their "natural" voice for traditional folk music and "rounded" singing for choral, CCM, and Bel Canto singing styles. Participants interviewed from both groups addressed the concern of sustained singing in extreme ranges and the vocal demand of blending their voices in a choral ensemble, indicating that these factors were more of a contributing issue to vocal fatigue than genre considerations. There were mixed results from participants in both groups regarding how they addressed vocal technique and vocal health in their own ensembles, especially as it related to genre and programming. The findings from this study indicate that trained semi-professional choral singers without indications of dysphonia can sing in these three genres without becoming fatigued. Implications from this research include creating a validated instrument for clinical and educational use that can be used to assess vocal health by analyzing the speaking voice, singing voice, and acoustical properties of the voice, which include assessment of vocal training, physiology, vocal loading, vocal hygiene, genre, and pathology of the voice.

Key Words: vocalist, sing, vocal lesions, choir, CCM, traditional folk, vernacular music, popular music, non-Western, music, physiology, vocal load, pathology, training, vocal hygiene, EASE, VFI, SVHI, CAPE-V, VoxMetria, critical pedagogy

Chapter 1: Introduction

Since the mid-20th century, the music education community in the United States has lamented that enrollment in traditional ensembles in schools was declining. Singers in adult community, religious, or professional choirs often have a background in the choral art that began in a school setting, but attendance in traditional ensemble classes such as chorus, band, and orchestra were down. Perhaps more importantly, it became clear that many students ceased their music making activities after graduation. The music of the people was changing, and students seemed less inclined to enroll in traditional ensembles as popular music genres such as rock, blues, gospel, pop, and musical theatre became a significant part of the mainstream culture outside the school settings.

To address this concern, in 1967, the Tanglewood Symposium called together leading figures in music education as well as scientists, labor leaders, educators, representatives of corporations, sociologists, musicians, and others to provide recommendations to extend the longevity of the arts in peoples' lives (Choate *et al*, 1967). One of the suggestions was to be more inclusive of all genres of music within the education process, to acknowledge that the "music of all periods, styles, forms, and cultures belongs in the curriculum... including currently popular teenage music" (p. 139). The term vernacular music is customarily used to describe traditional folk music. However, some have dubbed popular music genres as the modern form of vernacular music, or the music of the people (Woody, 2012). Modern vernacular music includes popular music styles such as pop, rock, jazz, gospel, musical theatre and other contemporary

commercial music (CCM) styles (Leborgne & Rosenberg, 2014). CCM is considered anything non-classical in nature that is promoted commercially.

Incorporating both traditional, folk, world, and popular vernacular music in addition to Western European classical repertoire selection has been a prominent charge in music education in the United States since the Tanglewood Symposium, and many more think-tank symposiums throughout the United States of America have continued to contribute to the discussion that began in 1967. Social, musical, and global rationales for including world musics in education were observed (Fung, 1995). There has been a rise in multicultural and intercultural music education across the globe since the 1980's (Ho, 2016). An analysis of the American Choral Director Association Conferences from 1960-2013 revealed that 27.3% of all choral repertoire sessions and 12.8% of performance practice now centers around music of diverse cultures, with a significant increase mainly occurring in the 1990's and after (Ferretti & Latimer, 2017).

Despite this shift in philosophy and the increase of both multicultural and CCM programming by choral directors, the majority of the repertory performed by choirs in contemporary United States falls in the Western classical choral category (Ferretti & Latimer, 2017). Many choral directors and musicians commonly cite that singing vernacular music may cause harm to singers' voices due to strain and improper vocal techniques employed within these genres. Some choral music educators are resistant to performing repertory outside of the Western canon, citing the historical treatises of vocal pedagogues regarding classical vocal technique. The "vocal health" of their singers is a major factor in repertoire selection for their ensembles (Ward-Steinman, 2017). Vocal health is defined as the absence of dysphonia, or "disorder of the voice" based on the Latin dys-(disorder) phonia ([of the] voice). In recent years, there has been an increasing awareness of potential harm to the voice by singing in both choral and CCM musical

genres with incorrect technique, as well as breakthroughs in voice science concerning some myths in regard to these concerns. Though there has been more awareness and training in multicultural repertoire selection and performance practices, little research has been conducted on the effect of singing traditional folk genres from around the world with respect to vocal health.

Choral music education has strong roots in the Western classical tradition and is therefore often approached from a Eurocentric standpoint. Missionaries who utilized singing as a tool for evangelism were primarily responsible for the spread of choral music outside of Western European countries (Southcott & Lee, 2008). With colonization, schools were eventually established incorporating Western choral music, and therefore musicians, composers, and consequently schools began to include these concepts of Western choral music into their materials (DeQuadros, 2012). The desire to learn about the cultural heritage of many traditions and the rise of technological advances in the 20th century made the world smaller and made the music of many world cultures and ethnicities accessible in schools and universities, eventually influencing popular musical genres. Green (2011) describes this as "musical colonization" (p. 13) and as the globalization of music that occurs when the music of powerful nations engulfs and "modernizes" the music of another culture.

This is clearly evident in the music of African nations that were colonized such as Kenya. The traditional music of the varying Kenyan cultural communities often incorporate Western chord structures combined with the rhythmic ostinatos, simple melodies, and driving percussive elements found in much of traditional folk music from the region. This combination has struck a chord with choral singers and their conductors worldwide and has impacted the music being performed by choirs of all ages in the United States, which often includes traditional folk music

from the African continent, particularly music from Kenya, South Africa, and Ghana amongst other nations.

While music education in Kenya is currently based on Western theories and underpinnings, there are basic foundational differences between the two. As one example, noted Kenyan scholar Emily Akuno cites the fact that there is no distinction between performers and the audience in the traditional music of the over 40 cultural communities present in Kenya, unlike in the Western tradition (Akuno, 2000). Audience members are rather part of the performance, joining in with "shouts, ululation, choral responses, and dance" (p. 4). Therefore, there is an improvisatory aspect to each performance. Porter (2000) states that one of the "instruments" are the people surrounding, with their stomping, singing, clapping, chanting, and many other sounds, all of which are woven into a complex rhythm that is improvisational in nature. This may be because singing begins when a child is able to talk and is done daily within the culture regardless of ability (Porter, 2000; Simako, 2009).

These descriptions bear resemblance to some CCM performances such as rock and pop concerts, where the audience and the performers interact and influence each other. Both the traditional folk music of Kenya and CCM incorporate stylistic sounds and techniques that are discouraged in Western classical vocal technique. While there is no current research comparing the traditional singing in Kenya with varying characteristics of CCM singing, anecdotal evidence suggests that there may be similarities between their vocal technique, production, and sound characteristics.

Statement of the Problem

Many of the vocal practices employed by CCM performers in popular styles such as rock, pop, jazz, gospel, other contemporary genres, and particularly the broad category of musical

theatre are well documented for the damage that they cause when the singers are not trained properly (Guss, Sadoughi, Benson, & Sulica, 2014). It is not uncommon to hear of cancellations of concerts, periods of vocal rest, speech and voice therapy, and even surgery as a result of the over use or abuse of the voice in artists such as Adele, John Meyer, Keith Urban, Sam Smith, Meghan Trainor, Nicki Minaj, Michael Bublé, Dan Reynolds (Imagine Dragons), Christina Perry, Frank Ocean, Shirley Manson (Garbage), Justin Timberlake, and Beyoncé. Popular artists from previous decades were not immune either, with Stephen Tyler (Aerosmith), Celine Dion, Bono, Cher, R. Kelly, Shania Twain, Lionel Richie, Paul Stanley (Kiss), Mariah Carey, Roger Daltrey (The Who), Elton John, Willie Nelson, Whitney Houston, and Rod Steward, all having been reported to suffer from some form of vocal disorder or problem. Even highly trained popular artists such as Freddie Mercury (Queen), Lady Gaga, Patty LuPone, Frank Sinatra, and Julie Andrews have suffered some form of vocal disorder in their performing careers. These incidents and more are well recorded and widely referenced (Feist, 2017; Lipshutz, 2012; Ryan, 2017; Warner, 2017).

This list of artists, along with countless others not widely reported, seems to confirm the fears of choral music educators are often cited as a warning to students to avoid the stylistic attributes employed in these genres. Yet we know that in all likelihood, choral singers listen to and often formally or informally sing along to vernacular music despite these warnings. Music sales over time and the decreased market share of classical genres such as opera, oratorio, and art songs indicate that the gap is widening (Kraenzel, 2017). While many choral directors do incorporate popular styles of music into their curriculum, they often do so begrudgingly and argue not only a lack of complexity and quality within the music and text, but also

predominantly cite the concern for the well-being of their students regarding vocal health and life-long singing (Ward-Steinman, 2017).

Despite this stigma, vocal issues are not just consigned to CCM artists and performers. Less publicized is the fact that classically trained singers are not immune to vocal pathology and disorders, though they are often referenced as models of "healthy singing" by vocal pedagogues. About half (51%) of classical singers reported varying vocal issues at some point in their singing careers, and 23% of classical singers cancelled performances due to vocal issues in one year (Phyland *et al*, 1999). Classically trained and professional singers such as Aleksandrs Antonenko, Roberto Alagna, Rolando Villazón, Natalie Dessay, Luciano Pavarotti, and Denise Graves have all received treatment for vocal issues in the past (Edwards, 2015; Feist, 2017; Warner, 2017), a fact that seems to contradict the theory that classical training prevents vocal disorder. In an interview in 2012, Dr. Steven Zeitels (Harvard Medical School) stated that as of that time he had performed about 75,000 operations on the vocal mechanism, and 500-700 of those were on singers, the majority were opera singers because of the demands of their vocal use (Eldred, 2012).

This calls into question the concept of hegemony on the part of vocal music educators. Are choral conductors and vocal pedagogues wielding their influence over their ensembles, shaping and manipulating their beliefs based on historical practices, so these concepts of healthy singing have become common sense and taken for granted? Voice science is a relatively new field, and many recent studies have found that singing, regardless of genre, can be very athletic in nature. Just as athletes who play in sports can overuse or injure their musculature, or instrumentalists can overuse the extremities, so can singers of any genre be susceptible to injury

due to over- or misuse. In music, just as in sports, training and technique play a major role in healthy singing technique.

For many choral directors, vocal health and longevity of singing over the entire lifespan is of primary importance in their teaching philosophy. Yet vocal health may mean different things to different people, particularly outside of Western culture. A stylistic technique that may seem "unhealthy" to a trained vocalist in the Western tradition may be considered normal and desirable in other cultures. This is also true in the varying styles of CCM. While the physiological effect of certain stylistic approaches such as "belting" have been largely explored regarding the vocal health of singers (Leborgne & Rosenberg, 2014), there is much discrepancy as to whether training can produce a "healthy belt." This and other vocal techniques used in CCM could be compared to vocal techniques used in other cultures such as Intuit or Siberian Throat singing, Shan'ge (Chinese mountain singing) (Nattiez, 1999), or the daily and ritualistic music of the people of Kenya. It begs the question of how this compares to CCM vocal training methods such as Jo Estill's Voice Training Model, which targets mastery in the six areas that she deems necessary for CCM singing: twang, sob, belt, opera, falsetto, and speech (Steinhauer, Klimek, & Estill, 2017). Some of these techniques are considered taboo in the classical Bel Canto tradition, yet anecdotal evidence suggests that these techniques and others such as cries, sobs, raspiness, and hard glottal attacks may be used regularly by lifelong singers in Kenya.

Need for the Study

Ethnomusicologists have long studied and analyzed the music of non-Western cultures, recording and describing the unique vocal timbres and resonance used in the music of varying cultures, yet an exhaustive search of the literature produced little to no published research regarding the similarity of stylistic and vocal techniques employed in the traditional music of

non-Western cultures. The lack of research in this area may indicate that this topic is considered sensitive by vocal pedagogues, partially due to the musical nuances and largely due to being sensitive to cultural differences (Smith & Sataloff, 1999; Gunjawate *et al.*, 2017). It may also indicate that speech and language communication science disorders and voice therapy are not studied as widely in Kenya as they are in the United States. With the internet and increased globalization, music is becoming more homogenous as both Western and non-Western musics influence each other. Kenyan music and folk music from other African nations are sung more often by choirs in the United States as educators seek to fulfill the recent demand for a more diverse musical experience for their students. Despite the seeming similarities in vocal production and stylistic technique to CCM, many choral directors who hesitate to program CCM would program traditional music from these countries without having a clear picture of whether these techniques are considered vocally "healthy." There is a need to study this phenomenon so that choral directors and singers have a greater understanding of the vocal technique employed in diverse folk music from around the globe, and the implications of singing in these genres regarding vocal function.

Theoretical Framework

Though there has been an increase in multicultural choral music in the past 50 years, there is still a widening disconnect between singers who are immersed in the popular music culture and voice teachers and pedagogues who promote high art. Some choral conductors and voice teachers disregard the value of CCM, possibly marginalizing current and potential choir members who have a love of vernacular music. Likewise, singers not exposed to Western choral repertory may equally discount the value of the Western vocal tradition. This disconnect may be contributing to the dwindling membership found in traditional vocal ensembles. Both are

enslaved to their own ideals, circumstances, and beliefs, creating a gulf between the music and the people. Yet often the conductor, as the music educator regardless of the level of the ensemble, holds the power in terms of repertoire selection. If given a voice in repertoire selection, ensemble members and audiences alike might be more prone to incorporate more vernacular music within the choral repertory of their ensemble.

Critical theory is a philosophical approach to culture that seeks to confront the social, historical, and ideological forces and structures that produce and constrain it. This theory challenges societal and cultural fundamental frameworks (Bohman, 2016). Philosophers such as Fromm, Adorno, Horkeimer, Marcuse, Lowenthal, Pollack, and Weber laid the groundwork for this paradigm (Giroux, 1983; McLaren, 2003). John Dewey's theories on democracy and education have strong ties that also are rooted in critical theory. Prominent philosopher Paulo Freire's ideal of transforming the marginalized through the education process and as a practice of freedom are also rooted in critical theory (Freire, 2000). Another related philosophical branch, critical pedagogy is consistent with Dewey's (1916) concept of democratization in the classroom and declares that new knowledge is obtained by teachers learning students' experiences and background and using dialogue and collaboration for those experiences to bridge toward agency (Abrahams, 2017). This idea is related to Freire's proposed dialogical approach which is the counter-response to the "banking method" of education, where the bank represents the students, the teacher represents the depositor, and education is the deposit that frees and transforms the oppressed (Freire, 2000). Similarly, in *Art as Experience*, Dewey (1916) argues for the validity of what is considered "popular" art, and states that there should be a continuity of refined, or "high art" and every day activities and events to understand the aesthetics. He believed that the divide between life and school must be removed for effective education to take place.

Critical pedagogy, otherwise known as the "pedagogy of the resistance" addresses marginalization, power, politics, and hegemonic domination, and provides tenants that allow students and teachers to be co-collaborators in the process of creating agency and critical consciousness in the classroom (Abrahams, 2017). Critical pedagogy empowers critical thinking as these questions and others are addressed in this study. This relates directly to the divide between vocal practices of singers and their experienced conductors and educators.

This study is also based on a praxial philosophical view, specifically as it relates to multicultural education as a significant aspect of human engagement (Elliott & Silverman, 2015). There is an emphasis on diversity, social justice, and the ability to unify curriculum using these concepts (Elliott & Silverman, 2015). Praxialism is based on critical theory and relies heavily on the theories and beliefs of John Dewey and Paulo Freire. Praxialism is rooted in the philosophies of Aristotle, Alpherson, and Sparshott, and states that music education is concerned not only with music as a process, but the students and teachers having an education process that is mutually beneficial to each other, themselves, and the music. Elliott (1995) states that a core belief of Praxialism is that music is a "multidimensional, social-cultural process" (p. 39-45). He states,

> Music listening ought to be taught and learned in classroom situations that music teachers deliberately design to approximate authentic musical practices . . . the name for this kind of teaching-learning situation is curriculum-as-practicum. A music curriculum based on authentic music making serves to contextualize and situate listenership and its component knowings. (pp. 101-102)

This philosophy provides a theoretical underpinning regarding vocal health across cultures and the implementation of all genres in choral music by those who select the repertoire for their

ensembles. This critical pedagogy study poses an inquiry of whether it is possible to meld the concepts of caring for choral singers' vocal health in a responsible way while offering a musical education that allows students to serve as co-creators of knowledge (Freire, 2000), and engaging them in the musical styles that are sung both within and outside of formal choral ensembles with CCM and traditional music from Kenya and around the globe.

Purpose of the Study

Vocal pedagogues in Western cultures historically focus their theoretical framework on tenants of European classical singing or various genres included in CCM. As a result, the focus in pre-service music education curriculum is based on these Western foundations and concepts. Authenticity is a buzz word that is often used regarding the traditional music of any culture, yet the Westernized concept of vocal technique and pedagogy is often employed in the performance of world music in the interest of vocal health. This concept applies to the vernacular music of any culture as well. The purpose of this study was to explore the vocal health of choral singers from Kenya and the United States by measuring dysphonia in adult, semi-professional choral singers and to determine whether genre has an impact on healthy vocal production, particularly as it relates to vocal fatigue. An additional purpose was to analyze how music educators from both ensembles address vocal technique and programming decisions as they relate to genre, vocal health, and fatigue. The implications of this research are far reaching for choral music conductors and educators and their ensembles, as well as for singers of all genres in the United States and worldwide. By measuring the vocal health of highly trained and accomplished choral musicians from the United States and Kenya, comparing the vocal techniques and stylistic approaches incorporated in the genres that they sing, and analyzing the self-perceived effect of these genres on the level of dysphonia, more understanding may be revealed regarding the

importance of vocal health as a consideration for choral music educators when choosing repertoire for their ensembles. The research questions in this study were:

1. How do semi-professional choral singers from the United States and Kenya define healthy singing?
2. What is the overall vocal health of members of the Nairobi Chamber Singers in Kenya and the Festival Singers of Florida in the United States? What is the relationship between overall vocal health as measured by the SVHI, VFI, and an acoustical assessment in in relation to demographics, vocal training, physiology, vocal loading, vocal hygiene, genres performed, and pathology?
3. Is there a difference between music teachers and non-music-teachers in each ensemble regarding their overall vocal health? Within the population of music educators from each ensemble, what are the beliefs of vocal health, and vocal training, technique and pedagogy, and repertoire selection as it relates genres performed and the vocal health of their ensembles?
4. What is the effect of genre on vocal fatigue within and between the two ensembles, particularly regarding traditional Kenyan and other African folk music set for choirs, Contemporary Commercial Music (CCM) arranged for choral ensembles, and Western traditional and contemporary choral canon?

This study has potential implications for choral music education in the United States and Kenya, particularly in terms of vocal training techniques across multiple genres of music, including popular musical styles as well as the traditional music of other cultures, and the impact of singing these genres on vocal health. The results of this study may serve to inform choral conductors, music educators, clinicians, vocal pedagogues, and voice scientists regarding the

physiological impact of singing choral music from varying cultures and styles with authenticity in the vocal technique, and to ascertain if certain genres have a greater impact on vocal fatigue or dysphonia. This study could help choral music educators in repertoire selection, vocal technique consideration, and may help to continue to pave a way toward the vision inspired at the Tanglewood Symposium by furthering the mission presented so succinctly by its participants: to incorporate the vernacular music of the people to our students, and to encourage those who teach formal music curriculum to include informal music-making concepts present in both CCM and traditional folk music practices. By becoming more relevant and incorporating the practices within choral ensembles regardless of level that allow them to be healthy singers, the findings of this study could provide them with the information that may enable them to make music for life, regardless of genre, in a healthy way. It may also help music educators feel more informed when deciding whether to continue to heed the call of the Tanglewood Symposium from over fifty years ago regarding democratizing music of all cultures and genres in the music curriculum.

Definition of Terms

Acoustic Assessment. VoxMetria was used to assess both vocal Irregularity using jitter and shimmer measurements, and GNE or Glottal-to-Noise Excitation, which measures the amount of noise that escapes the folds in the form of breathiness.

CAPE-V. The Consensus Auditory-Perceptual Evaluation of Voice was developed as a tool for clinical auditory-perceptual assessment of voice. Its primary purpose is to describe the severity of auditory-perceptual attributes of a voice problem, in a way that can be communicated among clinicians. Its secondary purpose is to contribute to hypotheses regarding the anatomic and physiological bases of voice problems and to evaluate the need for additional testing (ASHA, 2006). Clinical instrument which is used to assess roughness, breathiness, strain, pitch, and loudness as well as provides an overall score from 0 to 100. "0" indicates no issue and "100" meant severe vocal dysphonia. The scale also has additional anchor points of mild, moderate, and severe deviation for the evaluator to categorize the results based on the score.

Classical Vocal Technique. Based on the Western tradition of Bel Canto singing and voice science. Often referred to as "legit" singing. Foundations of this technique vary by voice teacher and the school of training to some degree. Universally, this term includes principles of body alignment, breath intake and management or support of the breath during phonation, and resonance of the voice. Some associate vocal style or genres with vocal technique.

Dysphonia. Medical term for "disorder of the voice" based on the Latin dys (disorder) and phonia (voice). Functional dysphonia is poor voice quality without any obvious anatomical, neurological or other organic difficulties affecting the larynx or voice box. It is also referred to as functional voice difficulty.

EASE. Ability to Sing Easily (EASE) is a valid and reliable instrument that was designed to assess current vocal status, specifically as it related to vocal fatigue and vocal load in the singing voice (Phyland *et al*, 2013).

Form. In Kenyan education, form refers to the final years of secondary school. Form 4 is the last year of high school education.

Gastroesophageal reflux (GERD). Gastroesophageal reflux disease (GERD) occurs when stomach acid frequently flows back into the tube connecting your mouth and stomach (esophagus). This backwash (acid reflux) can irritate the lining of your esophagus.

Glottis – Opening between the two vocal folds; the glottis opens during breathing and closes during swallowing and sound production.

GNE (Glottal-to-Noise Excitation). Acoustical assessment as measured by Vox Metria. It is a measure of noise that escapes the glottis during phonation. Indicates the source of the vibrations as being from the vocal folds or from turbulent noise from within the vocal tract, measuring

glottal air leakage, or breathiness of the voice. The range is between 0.5-1.0, with the normal range between 0.5-1.0

Irregularity. Variations that occur in the fundamental frequency of the voice using both jitter and shimmer. A range of 0.0-4.75 to be considered normal, with a threshold of 10.00.

Jitter. Period perturbation quotient, which measures vocal stability, or vocal fold vibration. It is affected by a lack of control of the vocal fold vibration, and increases with dysphonia, resulting in hoarseness, or a harsh, rough vocal quality.

Larynx. Highly specialized structure atop the windpipe responsible for sound production, air passage during breathing and protecting the airway during swallowing.

Kenya Music Festival. The nation-wide music festival held annually in Kenya. This competition begins in small regions and lasts for several months all the way through the national level.

Mucosal Wave. Organized vibration of the vocal folds. When the vocal folds oscillate, the superficial tissue of the vocal fold is displaced in a wave-like fashion. The term refers to the successive movements of the vocal folds, either medially or laterally, which resembles waves in a fluid medium.

Pathology. A branch of medical science that studies the nature, effects, causes and consequences of disease. Also, a colloquial term referring to mean disease as, for example, "he didn't find any pathology" (meaning he found no evidence of disease).

Phono trauma. (a.k.a. vocal abuse), defined as trauma to the laryngeal mechanism (vocal folds) as the result of vocal behaviors that include yelling, screaming, throat-clearing. The repeated collisions of the vocal folds can lead to the development of lesions on the vocal cords that affect how they come together and/or vibrate. Laryngeal pathology such as vocal fold nodules and/or muscle fatigue often occur as a result of this trauma.

Semi-occluded Vocal Tract Exercise. Used in voice therapy and singing exercises, and involve narrowing at any supraglottic point along the vocal tract in order to maximize interaction between vocal fold vibration (sound production) and the vocal tract (the sound filter) and to produce resonant voice. Ex. Lip trills, straw phonation exercises.

Shimmer. Energy perturbation quotient, or amplitude instability as measured by glottic resistance in the vocal folds. It is affected by the reduction of glottal resistance, and a normal voice has a smaller amount of instability with sustained phonation on a single vowel.

Singing Voice Handicap Index (SVHI). 36-item self-reporting psychosocial instrument used in clinical settings which measures dysphonia in singers and encompasses any disorder of the voice. It is a widely used instrument for voice and speech pathologists, otolaryngologists, and vocal pedagogues, and evaluates the physical, emotional, social, and economic impact of vocal issues. Raw scores range from 0-144, which is multiplied by 100 and then divided by 144. Singers

without complaint have a median score of 22, and those with complaint had a median score of 61 (Cohen *et al.*, 2007).

Vocal Fatigue Index (VFI). 19-item self-reporting psychosocial instrument used in clinical settings with measures fatigue of the speaking voice as it relates to avoidance of use (subscale 1), physical discomfort (subscale 2), and the improvement of the voice with rest (subscale 3) which are each scored separately.

Vocal Disorder. Anytime that the voice does not work, perform, or sound as it normally should, so that it interferes with communication.

Vocal Fatigue. Vocal fatigue is defined by its symptoms. Specifically, the voice user perceives an increase in phonatory effort over time that may be accompanied by decreased phonatory function. The underlying bases of vocal fatigue appear to include the neurophysiological and biomechanical effects of extended periods of phonation. It can also be a function of strategies used to adapt to extended periods of phonation, such as the use of excessive muscular tension and suboptimal vocal fold posturing.

Vocal Folds. "Fold-like" soft tissue that is the main vibratory component of the voice box; comprised of a cover (epithelium and superficial lamina propria), vocal ligament (intermediate and deep laminae propria), and body (thyroarytenoid muscle).

Vocal Hygiene. The behaviors that positively or negatively affect the status of the voice (e.g. hydration, sleep, the effect of different foods, drinks (such as alcohol and caffeine), and medications on vocal function.

Vocal Loading. The demands placed on the vocal mechanism with use as measured by duration and intensity.

Vocal Nodules. Superficial lesions (callouses) on the lining of the vocal cords and usually occur in the middle of both vocal folds.

Chapter 2: Review of Literature

The topic of vocal health and pedagogy is a comprehensive one with many facets. In this review of the literature, I analyze the theoretical underpinnings and perspectives of vocal pedagogy, an overview of anatomy and physiology of the voice, as well as vocal pedagogy, health and dysphonia as they relate to the genres of Western classical, or Bel Canto singing, CCM genres, traditional folk music of world cultures including Kenya, and choral music in general. Additionally, the physiological aspects of vocal health are analyzed. Research regarding vocal music education curriculum and practices in both Kenya and the United States are presented, as well as an overview of how dysphonia is measured globally.

Theoretical Perspectives

Cultural and repertoire diversity in the music education classroom has become increasingly dominant since the Tanglewood Symposium (Choate *et al*., 1967) and the *Vision 2020* Housewright Declaration (Madsen, 2000). Music Education textbooks in the United States for both primary and secondary schools began including music from Japan, China, and West Africa as part of their studies, and by the 1980's expanded to the music of varying American descent, such as Native Americans, Latin Americans, and African Americans (Campbell, 2002). Despite the initiative for radical change, many choral directors and music educators continued to resist this concept for various reasons, creating an even larger gap between classical and vernacular music of either folk or popular tradition. In recent years, this concept is beginning to change the philosophy that drives music education, as stated by Göran Folkestad (2006):

> The question of whether or not to have, for example, popular music in school, is irrelevant: popular music is already present in school, brought there by the students, and in many cases also by the teachers, as part of their musical experience and knowledge…The issue is rather: how do we deal with it? Do we deny the fact that popular music is an essential factor of the context of music teaching in school, or do we acknowledge the students' musical experiences and knowledge as a starting point for further musical education? The same is true in deciding whether or not to pay attention to the fact that a lot of musical knowledge is acquired outside school, in informal musical practices, and that this is the learning experience of many students. (p. 136)

The gauntlet has been thrown, challenging music educators to engage and welcome musicians of all genres, and to meet their needs not as popular musicians versus those trained in classical styles, but rather as "two poles of a continuum" (Folkestad, 2006, p. 143). Green (2001) framed this concept similarly, saying, "as extremes existing at two ends of a single pole" (p. 6). Folkestad (2006) asserted that the most important issue in learning for students may not be the "style of music presented, but the approach to music that the content mediates" (p. 142).

Contrary to the concerns of even the most avid classical pedagogue, however, is the fact that dysphonia is not only consigned to popular musicians and their followers. It is rarely reported in the classically trained world that vocal strain, nodules, and polyps occur with highly trained "legit" vocalists as well. Perhaps because of the pride that classically trained singers have regarding their vocal health superiority, they are much quieter regarding vocal health issues than their popular music counterparts. Opera singers Luciano Pavarotti, Denise Graves, Natalie Dessay, and Rolando Villazón are just a few that have had major voice problems, yet these cases

are rarely spoken of. When Julie Andrews was told that she would never sing again because of her vocal nodules, the classical community was stunned, for she was considered by many to be a model of what was considered a healthy singing technique.

As Woody (2012) implied, if the goal of musical education is lifelong musicianship, then as educators we have the responsibility to give students the tools needed for autonomy in various forms of music-making. It is argued that by not being more inclusive of genres outside of the Western classical spectrum, including popular music styles within the music education curriculum, that we are doing a severe disservice as educators. Allsup (2016) put this very clearly when he stated,

> Have we forgotten who we teach? Do we, in other words teach a tradition, or do we teach a child? We can grow within our traditions, becoming ever-finer musicians, while experimenting with the surprises that attend a life of openness and curiosity. This is a quality teacher. This is the expertise that our students deserve. (p. 40)

This reiterates the belief of Freire (2000) that critical pedagogy depends on mutual respect, trust, and communication between the teacher and student, as well as reciprocal learning between both. Elliott and Silverman (2015) state, "music educators shouldn't be concerned with changing, 'bad musical taste' into 'good musical taste,'" but rather that music educators should be equipped to be "musical teachers for children everywhere" regardless of genre (p. 263). If a goal within education is to use education as direction as Dewey (1916) stated, then students can be guided when we create an environment that empowers them.

Ladson-Billings (1995) advocated for an approach to teaching that allowed for students to find success by drawing on their cultural experiences which she called Culturally Responsive

Pedagogy (CRP). She defined CRP as "a pedagogy of opposition not unlike critical pedagogy but specifically committed to collective, not merely individual, empowerment." (p. 160). Culturally Responsive Pedagogy was defined by Gay (2000) as "using the cultural knowledge, prior experiences, frames of reference, and performance styles of ethnically diverse students to make learning encounters more relevant to and effective for them" (p. 29). Similar to what John Dewey advocated for, CRP responds to the students' cultural background and makes classroom instruction more relevant to culturally diverse students. World Music Pedagogy (WMP) is a comparable pedagogical framework introduced by Patricia Shehan Campbell. This pedagogy stresses that the music of diverse cultures is meant to be explored, and she be done so within their cultural context (Bartolome, 2019). On the closed Facebook group regarding this pedagogy, it states that WMP "springs from a belief in the principles of democracy, both cultural and musical, as a driving force for the steady presence of musical diversity and equity in school music practice. As a pathway for fashioning powerful experiences in knowing diverse musical practices, systems, and cultures, WMP upholds music as a multicultural, intercultural, and international phenomenon" (Soto *et al*., 2019).

In recent years particularly, choral music education philosophy has embraced multiculturalism, interculturalism, and the singing of traditional music from a global perspective. Interestingly, this traditional music of non-Western cultures from around the globe employ some of the same stylistic approaches employed in popular musical genres, including the use of the vocal belt, singing in extreme ranges using extended vocal technique, singing with a higher set larynx and shorter vocal tract, employing the use of resonance beyond the head voice and mask including using the chest voice, using intentional raspiness, throatiness, and breathiness as a stylistic vocal tool, yet little research has been published regarding the perception of vocal health

in singers from these cultures. There is vast research on vocal health in CCM genres, and voice science has expanded greatly in the past fifty years particularly, offering new perspectives for those who sing and teach voice.

Vocal Health and Dysphonia

Vocal health can be defined as a lack of disorder (dys) of the voice (phonia). The vocal mechanism's primary function is to protect the airway and lungs from foreign objects. It also assists with stabilization in weight bearing activates. Its other purpose is to make sound, which humans have used for not only speech communication, but song. Just like with athletes who strain muscles, sometimes damage can occur to the vocal mechanism if it is used improperly. Rosen and Murry (2000) found that "common voice symptoms of singers include difficulty in the passagio, vocal endurance, and diminished range, especially at higher frequencies and difficulty with singing softly" (p. 371). Other common issues may include dryness, a break in the voice when singing, tightness in the throat, vocal fatigue after singing, strain, hoarseness, discomfort, a choking sensation, pain when singing, or even a loss of voice (Phyland e*t al*., 1999).

Disorders of the voice, or dysphonias, have been identified as affecting anywhere from 3% - 9% of the population in the United States (Hazlett *et al*., 2011). Singers self-report much higher numbers of dysphonia (46.01%) than the general population (18.8%) due to their additional activities (Pestana *et al*., 2017). There are studies showing that 11% - 81% of teachers from around the world experience some form of vocal dysphonia (Beeman, 2017; Smith, Gray *et al*., 1997; Smith, Kirchner *et al*., 1998; Titze *et al*., 1997). In a review of literature regarding prevalence of voice disorders in the United States and Sweden, Williams (2003) found that .02% of the population in those countries were reported to be professional voice users, but that this

subgroup accounted for up to 11.5% of those who sought care in a voice clinic with an important study cited Titze and others (1997). These high numbers showcase why the study of singing and vocal technique have inspired the field of voice science.

Voice science was born out of Manuel Garcia's invention of the laryngoscope in 1855 which allowed for a more scientific approach to vocal pedagogy (Harrison & O'Bryan, 2014). It has expanded with the introduction of new technology and the expansion of the study of the human voice that has occurred, particularly since the 1980's. Voice programs in higher education are based on the foundation of vocal pedagogy and voice science. The intricacies of vocal treatises and voice science are beyond the scope of this study, and the depth of knowledge and resources supporting voice science are exhaustive. I will provide a rudimentary overview of singing as it relates to voice science based on McCoy's (2018) overview of the subject involving elements of anatomy, physiology or how the body functions, acoustics, and resonance.

The vocal mechanism. To produce sound, any instrument must have a power source which initiates the sound, a sound source which is produced with vibratory function, a resonator system for the vibrations to resonate, and a system which allows for articulation (Figure 2.1). The power source is the pulmonary system which includes the lungs, muscles for inspiration including the diaphragm and external intercostal muscles, muscles for expiration including the internal intercostal muscles, the rectus muscles, external obliques, and internal obliques. The systematic process of controlling this system for singing is referred to as breath support or breath management.

The sound source, or vibratory function occurs in the larynx. The larynx is the size of a walnut in men or a pecan in women. It consists of four cartilages and one bone including the

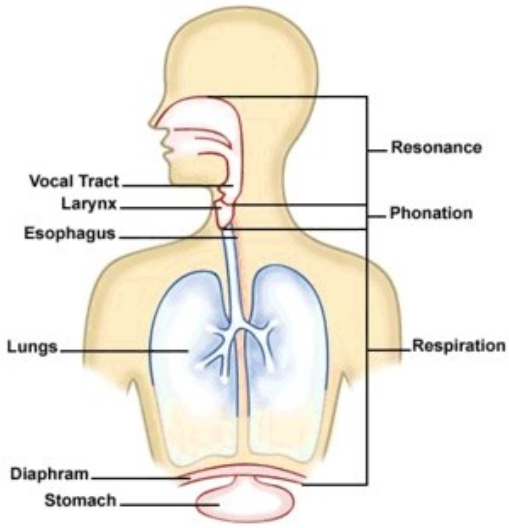

Figure 2.1. Overview of the vocal mechanism. Used with permission by Blue Tree Publishing (see Appendix A), © 2020 BLUE TREE PUBLISHING, INC.

thyroid cartilage, the cricoid cartilage, the arytenoid cartilages, the epiglottis, and the hyoid bone (Figure 2.2). Sound is produced when air flows through the opening between the vocal folds (called the glottis) which is about the size of an American dime in women or a nickel in men (Figure 2.3).

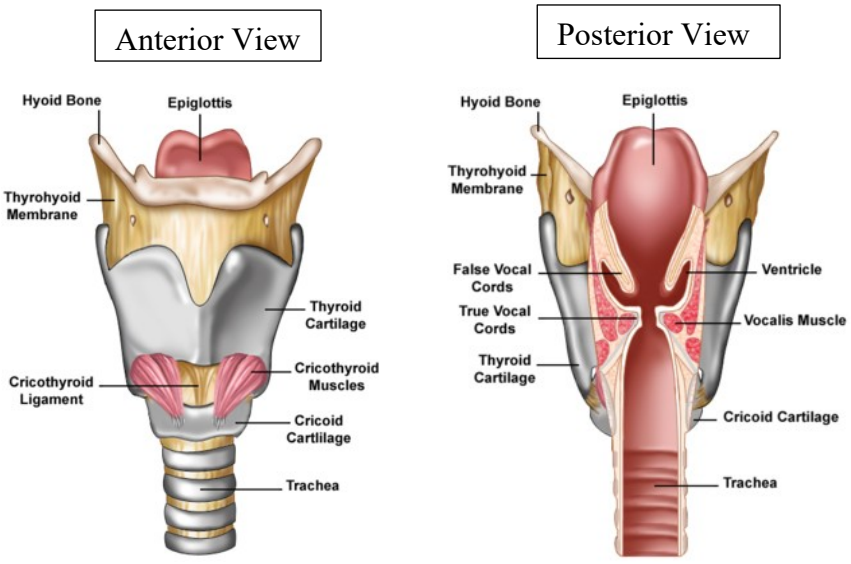

Figure 2.2. Anterior and posterior views of the larynx. Used with permission by Blue Tree Publishing (see Appendix A), © 2020 BLUE TREE PUBLISHING, INC.

The two folds form a shape like the letter “V” when breathing or what is called abduction, which engages the posterior cricoarytenoid (PCA). In healthy vocal production the folds meet together when phonating using the adduction muscles, the lateral cricoarytenoid (LCA).

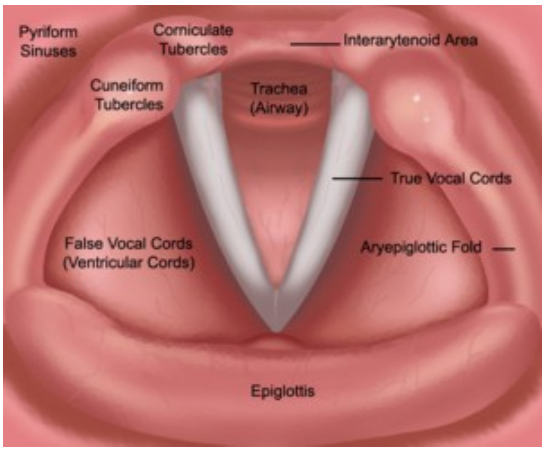

Figure 2.3. Superior stroboscopic view of the abducted vocal folds. Used with permission by Blue Tree Publishing (see Appendix A), © 2020 BLUE TREE PUBLISHING, INC.

The vocal folds are in three layers, and the wavelike motion of these layers is referred to as “mucosal wave”. There is musculature used to control the length and thickness of the vocal folds (Figure 2.4) including the thyroarytenoid (TA) which shortens the folds, making them thicker, and pitch generally goes down. It is used primarily in modal or chest register. The cricothyroid (CT) lengthens the folds, making them longer and thinner, and generally raises the pitch. It is generally used with falsetto, head, or loft voice. Vocal technique can be utilized to control the TA and CT muscles without necessarily changing pitch.

The Bernoulli Effect is the system that allows the vocal folds to move. The vocal mechanism approximates the vocal folds closing using the abovementioned musculature to prepare for phonation. The pulmonary system produces the airstream, which puts pressure

against the closed vocal folds until they are blown apart. The air rushes through this very small opening, which then creates a suction effect and closes the vocal folds with the cross-flow of air.

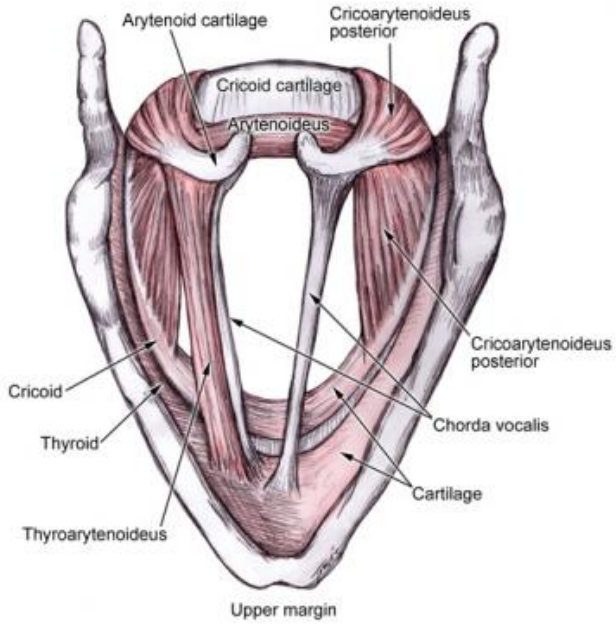

Figure 2.4. Superior view of the abducted vocal folds and larynx (Benson *et al.,* 2019).

This repeats during phonation at extraordinary speeds. The sound produced by this vibration of the vocal folds is merely a raw buzzing sound if it is not directed through a resonator.
The resonator (Figure 2.5) includes the vocal tract above the larynx, called the pharynx. Resonance is defined as the amplification and enrichment of musical sound through supplemental vibration. By changing the position of the tongue, lips, jaw, hard and soft palate, and larynx, the vocal tone color changes. The vibrations travel through the pharynx (cavity above the larynx and behind the nose and mouth), the nasopharynx (upper part of pharynx that connects with the nasal cavity above the soft palate), and the oropharynx (portion of the pharynx cavity which lies between the hyoid bone and the soft palate). Formants are how sound is transformed from the raw buzzing that is produced within the larynx to what is heard when speaking and

singing. The first two formants (F1 and F2) create vowel sounds. Formants 3-5 are what make the characteristic timbre of each individual's voice. Opera singers and other trained singers have trained so that F3-F5 are clustered together, and is called the singer's formant, which is how voices can be heard over an orchestra without amplification, and produces a "ringing" tone.

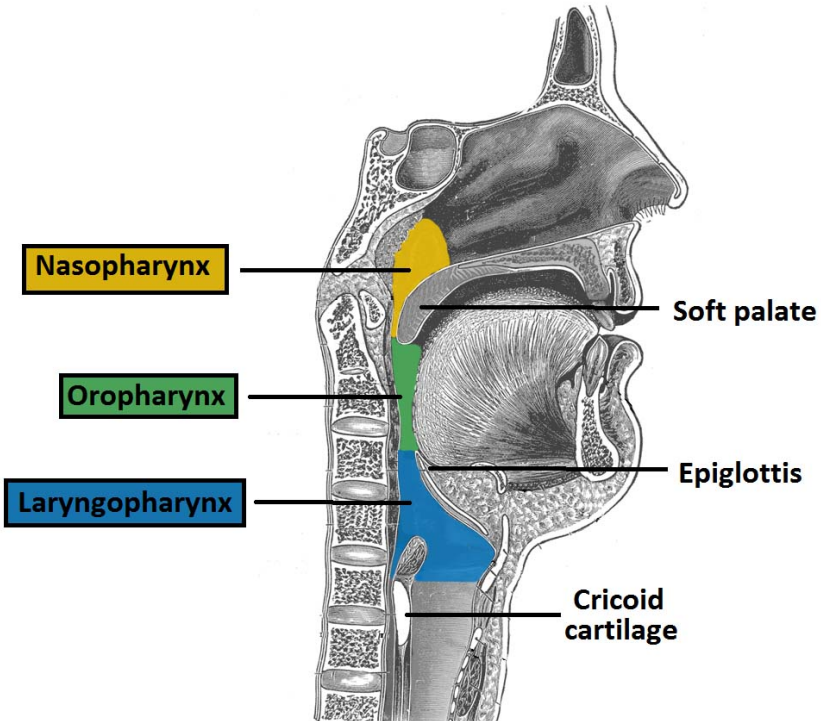

Figure 2.5. Resonators (Pazhaniappan, N., 2019).

The articulators are used to interrupt and organize the sound produced. The mouth, lips, teeth, tongue, and hard palate are used for articulation in speech and singing (Figure 2.6). The free-floating bone suspended at the top of the larynx hyoid bone is closely related to the tongue, jaw, laryngeal, and palate movement. When we swallow the palate naturally goes up and the larynx goes down. Singing in different genres requires different larynx positions and vocal tract lengths. In Western classical singing the larynx stays down and soft palate, or velum, is lifted

while in other genres and styles of CCM and world music singing the soft palate stays down and larynx goes up.

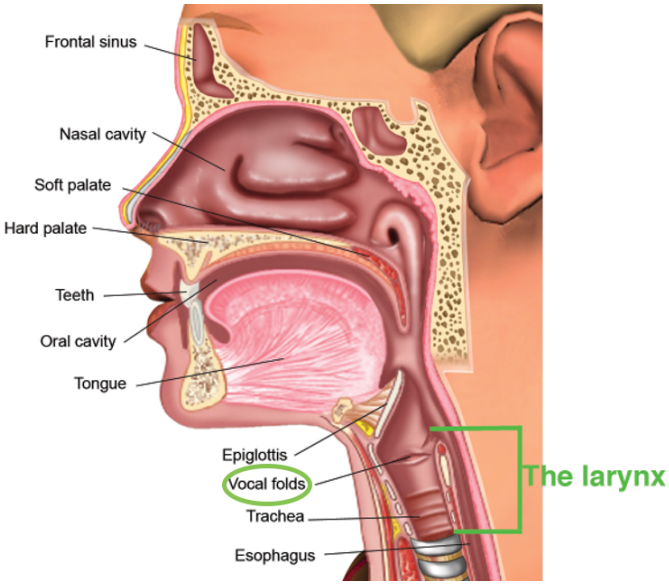

Figure 2.6. Lateral view of vocal resonator and articulators. Used with permission by Blue Tree Publishing (see Appendix A), © 2020 BLUE TREE PUBLISHING, INC.

Singers can be referred to as "vocal athletes" because of the physicality, endurance, stamina, and training needed to employ healthy vocal function (LeBorgne & Rosenberg, 2014). This is a very simplified explanation of the vocal mechanism and how it is used for singing. More in-depth study of the vocal mechanism can be found on websites for organizations such as the Voice Foundation (TVF), the National Association of Teachers of Singing (NATS), the American Speech-Language-Hearing Association (ASHA), or the National Center for Voice and Speech (NCVS) in addition to books and publications by renowned vocal pedagogues and voice scientists Wendy LeBorgne, Richard Miller, Robert Sataloff, Johan Sundberg, and Leon Thurman, or summarized collections such as *Vocal Science for Elite Singers* (Talia, 2017), *The Oxford Handbook of Singing* (Welch, Howard, & Nix, 2019), *Vocal Health and Pedagogy*

(Sataloff, 2017b), *The Structure of* Singing (Miller, 1996), and the five volumes of *Bodymind & Voice* (Thurman & Welch, 2000). Additionally, choral pedagogy textbooks such as *The School Choral Program* (Holt & Jordan, 2008), T*he Anatomy of Tone: Applying Voice Science to Choral Ensemble Pedagogy* (Jordan *et al*., 2017), *Choral Pedagogy* (Smith & Sataloff, 2013), *The Oxford Handbook of Choral Pedagogy* (Abrahams & Head, 2017), and *The Cambridge Companion to Choral Music* (de Quandros, 2012) offer extensive insight into the vocal mechanism and voice science as well as universally accepted techniques and vocal pedagogical approaches to Western choral singing.

For an extensive overview of voice science as it relates to CCM singing genres, *So You Want to Sing CCM (Contemporary Commercial Music): A Guide for Performers* (Hoch, 2018), *Teaching Singing in the 21st Century* (Harrison & O'Bryan, 2014), a recently published dissertation by Marisa Naismith (2019), and the chapter entitled "Pedagogy of Different Sung Genres" in *The Oxford Handbook of Singing* (Welch, Howard, & Nix, 2019) offers an in-depth overview. While there are little to no voice science and vocal pedagogy resources available regarding vocal pedagogy in Kenya, one resource is invaluable on this topic: *Folk Music of* Kenya (Senoga-Zake, 1986). A newly published resources, *So You Want to Sing World Music: A Guide for Performers* (Hoch, 2019) and *World Music Pedagogy: Choral Music Education* by Sarah Bartolome and Patricia Sheehan Campbell (2019) offer new insight into global vocal practices. The Smithsonian Folk Ways Institute and recordings (https://folkways.si.edu/) are additional invaluable resources for traditional folk practices of indigenous communities. Many of these listed voice science, Western classical, choral, CCM, and world music resources are cited throughout this study, while others are not directly referenced but their contents have shaped the study.

Genre implications of vocal technique. Vocal health in singers is based on the scientific study of the anatomical and physiological response to singing and how the mechanism functions when used properly and improperly, and is well documented by experts in the field of vocal pedagogy and otolaryngology (LeBorgne & Rosenberg, 2014; Miller, 1996; Sataloff, 2001; Sataloff, 2017b; Sundberg, 1987; Titze, 1994). The separation of a trained and untrained singer lies in breathing technique, larynx setting, and vocal tract and placement setting and resonance, or a combination of two or more of these factors (Howard, 2009).

Singing uses the same structures as the speaking voice, but with adjustments in trained singers such as intentional control of the breathing mechanism, a greater volume of air that is faster moving and controlled, a higher closing coefficient of the vocal folds in the vibration cycle, a generally lower larynx, resonance that is concentrated in the upper part of the vocal tract, and a greater control of the airflow which allows for vocal projection and dynamic contrast; all of which allow for a greater range of pitches to be utilized than the typical speaking range (Salvatico de Aquino & da Silva Teles, 2013). Vocal training (regardless of genre) has some overarching themes such as singing appropriate repertoire, efficient usage of the vocal mechanism, principles of breath support, posture or alignment, singing in an appropriate range, and relaxation of the supporting musculature of the mechanism (Koufman *et al*., 1996). Stylistic approaches and physiological demands in singing different genres are thought to account for differences in vocal health and laryngeal pathology, but different studies present conflicting evidence (Burns, 1986; Davies & Jahn, 2004a; Kwok & Eslick, 2019; Phyland *et al*., 1999). Exhaustive research has been published regarding the vocal health of singers as it relates to various genres being performed, particularly in relation to Western classical or bel canto and Contemporary Commercial Music (CCM), which refers to non-classical music genres such as

jazz, folk, gospel, blues, country, rock, and musical theatre. However, little to no research has been published regarding defining or measuring vocal health when singing the traditional music of non-western cultures (Gunjawate *et al*., 2017; Smith & Sataloff, 2013).

In a study (Koufman *et al*., 1996) of 100 healthy singers (48 professional, 52 amateur), it was determined that their muscular tension was not significantly different, though singers of classical styles of music (art songs, opera, and choral music) had significantly lower muscular tension, with choral singers showing the least tension. Singers whose primary genres were musical theatre, bluegrass and country western, and rock or gospel had significantly higher muscular tension, with rock and gospel rating the highest. However, when classical singers sang in non-classical styles, their scores notably increased. Race played a role in this study as well. Black singers were equally displaced between classical styles (n = 5) and non-classical styles (n = 5), yet had a significantly higher muscle tension score than white singers. Singers with formal vocal training and/or warmed up prior to singing had significantly lower muscle tension scores.

Western Classical Pedagogy. The most common terms used to describe this Western approach to classical vocal technique and training are "Bel Canto" singing, or "Classical" singing, and is often referred to as "legit" singing. For the purpose of this study, it will hereafter be referred to as either classical (as in Western classically trained) or Bel Canto singing. Sperry and Goetze (2014) describe western classical technique as the "onset of tone from the breath, a lowered laryngeal position, "forward" placement of the tone, and a blending of vocal registers to maximize range with a preference for head register (p. 62), particularly by bringing the head voice down through the passagio. Principles of diaphragmatic and intercostal breath intake, breath management that supports the voicing being performed, vocal resonance, a lowered larynx, and tension-free freedom and beauty of the tone produced typically characterize "healthy

singing" in Western constructs (LeBorgne & Rosenberg, 2014). Classical singing is additionally characterized as smooth, having an even control of pitch, intensity, and timbre with a wide opening of the throat (pharynx), equal resonance across all vowels, vigorous action of the vocal folds, great space between the tongue and lower pharynx, and a tightening of the pharyngeal walls, and a lowered larynx which produces a fuller sound with "ring" (Dromey *et al*., 2011; Miller, 1996; Shipp, 1987; Sundberg, 1974).

The pharyngeal space is more open toward the back of the throat combined with a lowered larynx. These features combined create a sense of resonance, particularly when combined with a lifted soft palate (Caffier *et al*., 2018; Sperry & Goetze, 2014). Classical singing style is often characterized with a longer vowel-to-consonant relationship (Sundberg & Romedahl, 2009), and beauty of tone (e.g. "beautiful singing") is of utmost importance.

Female voices using this technique often employ extensive use of the head register, or loft, with little implementation of the chest register, particularly above F4 (Kayes & Welch, 2017). The principle of chiaroscuro (the combination light-dark tone production) is a main pillar of classical singing, and provides both clarity and depth to the tone production (Caffier *et al*., 2018; LoVetri & Weekly, 2003; Stark, 2003; Sundberg, 2003; Sundberg & Romedahl, 2009). Other principles of Western classical vocal technique include a raised soft palate, tall and rounded vowels, using the least amount of effort while producing a powerful product, delivery of consistent vibrato, and live performance without the need for amplification (Caffier *et al*., 2018). Classical singers may be likely to use vocal warm-ups than singers in CCM genres, and generally employ a neutral posture when singing (Kwok & Eslick, 2019).

These characteristics represent the classical, Bel Canto style and are not representative of all styles, though these techniques often transfer to choral singing. To avoid physiological

damage, vocal pedagogue Richard Miller states that common practice in Western traditions recommends training in areas of breath management, sustaining the voice, vocal flexibility, the ability to adjust resonant balances, and to produce clear and understandable diction in any vocal idiom (Miller, 2004).

CCM Vocal Pedagogy. The term "Contemporary Commercial Music" was coined by Jeannette LoVetri, having prior to that time been described as "non-classical" singing (Woodruff, 2011). LoVetri also described the CCM genre as vernacular music, or "music of the people" (LoVetri, 2008). The extent of vocal training in CCM genres is extensively less than that of the vocal training in classical genres (Bartlett & Naismith, 2020; LeBorgne, 2018; Potter & Sorrell, 2012; Radionoff, 2015; Winnie, 2017). Formal music education has long been exclusionary of popular music education. In fact, the field of popular music education was only officially recognized through academic publication in 2017 (Smith *et al*., 2018). Because of the lack of availability for formal training, vocal athletes in the CCM market often self-train in order to maintain stamina, agility, flexibility, and power (LeBorgne, 2018; Reinhert, 2019).

It was long-believed that singing outside of the Western classical approach would damage the voice. As recently as 1986 the American Academy of Teachers of Singing (AATS) mindset was that "nonclassical singing" was very unhealthy for singers. Robert Edwin and others were seminal in changing this perspective through the study and publication of voice science through both NATS and the *Journal of Singing* (Hoch, 2018). In 2008, AATS formally changed their position and declared that "while it is true that all singers must breathe, phonate, resonate, and articulate, they do not necessarily approach these technical elements in the same manner" and that "classically-based vocal technique alone does not serve of the world's diversity of singing styles" (p. 1).

CCM styles and genres all originated from untrained singers and from all over the United States (Woodruff, 2011). While lack of voice training in popular singers may be a factor, there is an abundance of recent research that indicates that some of the stylistic approaches employed in popular genres that were historically widely considered unhealthy (AATS, 1986; Borch *et al.,* 2004; Hoch, 2018) can actually be taught over time using vocal techniques in such a way as to diminish or even rule out this concern. Even the staunchest of vocal pedagogues are beginning to acknowledge that this foundation of singing technique can be applied throughout most genres (LeBorgne & Rosenberg, 2014). Functional requirements in vocal technique for contemporary singing varies from Western classical vocal technique (Bartlett & Naismith, 2020; Wilson, 2004; Woodruff, 2011). There are physiological differences as well as mechanical ones in the vocal production techniques of CCM singing such as tone with a more forward and bright quality ("chiaro" or bright, as opposed to "scuro" or dark), breath management, registration, the technical requirements and effects according to style, vocal quality, diction, use of the laryngeal musculature, lowered soft palate, narrowed pharynx, use of vibrato, spread mouth and the use of speech quality phonation in CCM singing (Bartlett & Naismith, 2020; Hanlon, 2012; Hoch, 2018).

Both subglottic pressure and the airflow used in vocal production are different for CCM genres than in classical singing technique (Sundberg *et al*., 1993). There are registration differences in CCM singing as compared to Western classical (Edwin, 2013, Bartlett, 2014a; Bartlett, 2014b). Additionally, there are significant differences between the vocal tract configuration, breath management, vocal onset, range, and tonal quality in CCM singing styles (Estill, 1988; LoVetri, 2002). There are significant differences in tone production between CCM and Western classical singing (Schutte & Miller, 1993). CCM singers who are well trained are

able to alter their tone quality by creating nasal resonance by altering the shape of the laryngopharynx (the throat), the nasopharynx (the nasal port), and the oropharynx (the mouth) cavities without sounding hyper-nasal (nasality) (Weekly & LoVetri, 2009). Voice science research indicates that changes in the vocal tract and larynx height to produce varying sounds such timbres such as twang, yawn, or other sounds outside of Western classical vocal technique do not pose any risk to a singers' vocal health if done properly, which can influence our pedagogical approach to these vocal qualities (Winnie, 2017). In Western classical vocal tradition, a consistent tone quality across all registers is an important element, unlike in CCM genres where the vocal production and quality are changed to meet the style (Bartlett & Naismith, 2020; Woodruff, 2011).

CCM singing styles are very similar to speech patterns and use a somewhat limited range, unlike classical which is louder, uses more of the vocal range, and is predominantly sung in the head register, particularly in women, and use colloquial pronunciation that is not overly articulated (Woodruff, 2011). Expressivity in vocal training in CCM styles is similar to that of Western classical: range expansion, dynamic contrast for expression, singing through sustained phrases with control over dynamic contrast throughout the extended phrases, singing freely and easily, and singing using a wide variety of tone qualities (Woodruff, 2011). In a qualitative study of nine specialists of CCM vocal pedagogy, Bartlett and Naismith (2020) found that all of them stressed vocal freedom of using a healthy, flexible usage of the voice when producing style effects in CCM genres, that their pedagogy was largely based on helping their students become effective communicators of the lyrics, creating an authenticity of vocal production that was specific to the sub-genre of CCM singing being performed, and the ability for students to find a unique sound for their individual sense of artistic expression. The majority of the participants

also taught principles of alignment (balanced, tension-free, natural/neutral alignment which directly impacts breath flow, abdominal support, and vocal production but can be adjusted in a case-by-case scenario); breath management (how the breath is used to phonate, natural breathing style, and should be sufficient to support the repertoire and vocal task demand); and breath flow or support (specific for the repertoire or style demand, use of balanced breath, and can be addressed as needed) (Bartlett & Naismith, 2020).

American popular music found its roots in either traditional folk or classical tradition with a wide blend of influences (Woodruff, 2011). In order to develop a unique and authentic sound, sometimes singers with voice disorders are hired because the unique and characteristic sound of their voice despite the presence of functional voice disorder or pathology of the voice (LeBorgne, 2018). For example, in pop singing vocal harshness may be employed for stylistic purposes, with more consistent contraction of the arytenoid and thyroarytenoid muscles (Davies & Jahn, 2004a). Gospel singing can include growling, screaming, and increased glottal tension (Koufman *et al*., 1996). In country music a more hyper nasal sound is generally produced using a higher laryngeal position (Davies & Jahn, 2004a), whereas jazz singers often implement a breathy quality. In *Teaching Vocal Music in the 21st Century*, Kim Chandler (2014) created a table which described characteristics used in varying CCM genres (Table 2.1).

One study in the United States (Erickson, 2012) analyzed the vocal health of primarily untrained regional artists that perform traditional or acoustic music such as Americana, folk, bluegrass, traditional, old-time, blues, jazz, and other traditional American styles. Some of these genres are considered popular genres in the CCM umbrella while others could be considered American traditional folk music. The most prevalent styles performed by participants in this study were folk, rock, country, and blue grass, all CCM genres. Fifty-six percent of the

Table 2.1.

Broad generalizations of stylistic variation

Rock: This is a strong, direct vocal style delivered with high intensity. It can be heard using clean tone, but vocal grit and distortion are more usual. It favors vocal power and size over vocal embellishment and flourish

Soul: Having come straight out of the Black Gospel church, this vocal style favours emotionality delivered via a wide dynamic range, legato phrases and some melodic embellishment

Funk: Though having grown directly out of Soul music, Funk differs by being more punctuated, energetic, rhythmically percussive and less embellished. The melody lines are often like horn (brass) parts and the rhythmic phrasing pushed

R&B: Early R&B was synonymous with Soul & Funk, whereas the more recent Pop R&B often fuses with Hip Hop and Rap. It's characterized by a relatively light vocal delivery with heavy use of embellishment, melisma and fast vibrato

Dance: This is a wide genre vocally if one considers the fact that it covers everything from the often dreamy, light vocals of Trip Hop, through the Funk/Pop singers of Funky House to the belty Soul 'divas' of the charting Dance Anthems

Reggae: Given its Jamaican roots, the accent that Reggae is sung in is highly distinctive. It's generally sung at a medium level of intensity and features minimal vibrato. It's often back phrased

Folk: This style arguably requires the lightest vocal delivery because of the acoustic instruments used in the accompaniment. The lyrics and the story-telling elements of the song are paramount. Singing in regional accents is also embraced

Country: Due to its musical roots, this twangy vocal style is delivered in a strong 'Southern' accent and often features stylistic flips (similar to yodeling) and little 'cries'. It's mostly at a medium intensity and can feature some melodic embellishment

Indie: Is for all intents and purposes a Pop/Rock fusion vocally, but is generally characterized by a rawness & edginess in the vocal delivery and by minimal use of vibrato. An element of quirkiness in the vocals is embraced in this genre

Metal: Having come out of Heavy Rock, this is the most extreme vocal style and requires the highest intensity levels. It features highly expressive, aggressive vocal sounds not heard much in other genres and is physically very demanding

Reprinted with permission from Chandler (2014, p. 49)

participants ($N = 270$) had experienced vocal problems, and those with some formal training reported significantly less problems with their voice ($p < .05$). Forty-one percent of these singers had reported vocal fatigue, and 30% had experienced loss of vocal range.

Musical Theatre. While some consider musical theatre a component of CCM, others categorize it as its own genre with subgenres within it (Edwards & Hoch, 2018). Musical Theatre is an American art form that began in the 1920's, birthed from American Vaudeville, European operetta, and British Musical Comedy (Gänzl & Lamb, 1988). Some trace it back even further to *The Black Crook* (1866) (Edwards & Hoch, 2018). Subgenres can be categorized as traditional musicals (musical drama and musical comedy), contemporary (concept and book musicals), and pop/rock musicals (jukebox and original works written for the stage by commercial artists). In modern musical theatre, many elements and stylistic effects from CCM styles such as gospel, pop, and rock are employed including slurs, sobbing, growls, melismatic runs, shrieks, slides, and many other stylistic noises that are definitive of CCM genres are incorporated (Edwin, 2007; LoVetri & Weekly, 2003; Wilson, 2004). Pop/Rock musicals particularly utilize rhythmic singing, growls, riffs, and vocal fry are other CCM techniques that are utilized to further the storyline (Edwards & Hoch, 2018).

Musical theatre singing is described by voice teachers as having brighter and less round vowel sounds, more forward placement with register differences, more speech-like and natural production, less formal musical style, a different vocal range (usually lower), and louder dynamics (LoVetri & Weekly, 2003). Unlike in Western classical or Bel Canto singing where beauty of the voice reigns supreme, the intelligibility of the text is a key component of this style regardless of the subgenre (Fisher *et al*., 2019; LoVetri *et al*., 1999; Melton, 2007). Vowels are less elongated and consonants are more emphasized (Banfield, 2002; Callaghan *et al*., 2018; Kayes & Welch, 2017; Sundberg & Romedahl, 2009).

Microphones were introduced in 1925 (Edwards & Hoch, 2018), which changed the nature of vocal tone in musical theatre singing. Older, more traditional musical styles were

bound by the need of the singers to be heard over the orchestra, therefore "legit" singing was the norm, except in the case of Tin Pan Alley-style musicals, where a very bright, forward, "trumpet-like" timbre was combined with speech-like singing, which also cut through the orchestra sound (Edwards & Hoch, 2018). This genre is now typically more conversational in nature due to the intimacy that becomes an option thanks to acoustical enhancement (Callaghan *et al*., 2018; Fisher *et al*., 2019; Kayes & Welch, 2017; Melton, 2007). Contemporary musicals beginning with musicals such as *Hair* utilized microphones to re-create the feel of a rock concert (Edwards & Hoch, 2018) further altering the acoustical properties in musical theatre subgenres.

One of the most controversial of stylistic techniques employed in CCM and musical theatre is "belting". It is often referenced as a major concern for voice teachers and choral music educators when considering incorporating popular genres of music into their curriculum repertoire. The term belting has been used in professional theatre and Broadway since the 1920's (Banfield, 2002; Pleasants, 1974) yet there is discrepancy in its' definition (Sundberg, 2000). Belting has generally been described as a "voice quality close to a speech-like, yell-like, shouting, or 'natural' form of voice production used in singing, which has often been associated with contemporary commercial music genres" (LeBorgne & Rosenberg, 2014, p. 219). This term also implies powerful, speech-like vocalization in a high vocal register with intensity (Bourne *et al*., 2016; LeBorgne *et al*., 2010; Lebowitz & Baken, 2011). Estill (1988) described it as "loud, brassy, sometimes nasal, always 'twangy', and sounding like organized yelling." (p. 38)

Use of a belting vocal quality uses a similar approach to breath support and management, but creates more subglottal pressure on the larynx as opposed to a more natural or neutral approach to singing (Sundberg & Thalén, 2015). Previously belting was believed to be solely produced using TA or chest voice function beyond the female second passagio, or registration

break (Spivey, 2008). In general, voice teachers agree that belting uses varying vocal registration (LoVetri & Weekly, 2003; Weekly & LoVetri, 2009). A full belt utilizes a high, loud, chest dominant sound that is brighter, employs an elevated larynx, long closed glottal phase, is heavy sounding, and has more thyroarytenoid (TA) activity in the vocal mechanism. "Legit" singing in musical theatre genres generally refers to the sound quality produced using a classical head register, or a "head-mix" (Balog, 2005; Miller, 2000). It is used primarily for singing in traditional musicals (Edwards & Hoch, 2018), and the cricothyroid (CT) is more engaged. A vocal mix is a balance of thyroarytenoid (TA) and cricothyroid (CT) activity (blend of chest and head register sounds). Also prevalent is the use of a chest mix which is a chest-dominant, heavier vocal mix, and more TA dominant.

The more common range of belting has changed for female singers in the past several decades. Ethel Merman, one of the originators of the vocal belt gained recognition by producing a belt when sustaining C5 in "I Got Rhythm" (Banfield, 2002). Some current musical theatre subgenres require female belters to sustain a belt as high as F5 (Roll, 2016). Sustained belting or a mix is expected for performers in contemporary musicals (Edwards & Hoch, 2018). Singers who belt often, and predominantly sing using their chest register or a chest-mix tend to have a weaker Fundamental Frequency [F(0)] due to the repeated use of thick vocal folds and higher activity in the adductor muscles (Kayes & Welch, 2017; Björkner, 2008). This is similar to the concept of training for sprinting versus long-distance running. The training and development of one set of muscles is not always beneficial for all of the muscles used in running, hence the muscular difference between these two types of runners. The same can be said of those who train their voices in one primary genre. Studies of the vocal mechanism show that the larynx is raised when belting and the vocal tract shape changes, which is therefore is contrary to the Western

classical principle of keeping the larynx low during phonation (Echternach *et al*., 2014; Sundberg *et al*., 1993; Titze, 2007). Voice disorders in CCM singers range from vocal fatigue to acute vocal injury and phonotrauma; from hoarseness to loss of range, particularly in their upper register (LeBorgne, 2018).

Current research is showing that with proper training even this controversial vocal technique can be taught in such a way to minimize risk (Miller, 2004, LeBorgne & Rosenberg, 2014; Roll, 2016; Sataloff, 2017a; McGlashan *et al*., 2017). CCM pedagogues indicate that healthy belting is done using closed vowels, maintaining speech-like quality, and incorporating head voice or loft function into a vocal mix (Roll, 2016). The effects of belting can be eased engaging the sphincters of the vocal tract within the pharynx, epilarynx, the larynx including both the ventricular folds (or false vocal folds) and true vocal folds are believed to be able to adjust separately, accounting for moderate adduction and lessened vocal loading with the usage of the aryepiglottic sphincter (Yanagisawa, Estill, & Kmucha, 1989).

Belting is not the only controversial extended vocal technique implemented in CCM genres. There are many approaches to teaching these effects such as the Complete Vocal Technique (CVT), an internationally recognized pedagogical approach that was introduced in 1991 by Cathrine Sadolin (Sundberg *et al*., 2017). It features training on vocal effects such as creaking, distortion, rattle, growl, grunt, vocal breaks, vocal fry, screams, breathiness, ornamentation, and varying vibrato techniques (Sadolin, 2000) with the foundation of these effects derived from four modes of singing which include neutral, edge, curbing, and overdrive. All of these techniques are able to be produced without adverse effects to vocal function (Borch *et al*., 2004; Caffier *et al*., 2018; Guzman *et al*., 2013; McGlashan *et al*., 2017; Sadolin, 2000)

An evaluation using a laryngoscope of twenty professional singers that were formally trained in this vocal technique found that there were no indications of damage to the vocal folds or the surrounding vocal mechanism, nor any sign of fatigue prior to, during, or after performing these effects multiple times (Aaen *et al*., 2018). The participants' self-reporting assessment to self-assess their vocal health also indicated that there were no perceived problems with their voices. In another multiparametric study regarding the speaking voice of pop singers, Guzman, and others (2015) found that there was no adverse effect from singing in this genre on the speaking voice.

These studies conflict with others that indicate that singing in CCM genres can impact the vocal mechanism negatively. In a study of performers who receive the majority of their livelihood from singing, Guss, Sadoughi, Benson, and Sulica (2014) found that musical theatre performers presented with hoarseness more than other genres studied. Performers in CCM subgenres sing with more pressed phonation than in other genres, and this may make these singers more predisposed to phonotrauma over time (Koufman *et al*., 1996). The primary reported causes for dysphonia in CCM singers are lack of sleep, rehearsal duration, overuse of the voice in speaking engagements and "meet and greets", high vocal loading, frequently singing outside of the tessitura, and the vocal "gymnastics" needed to perform certain vocal effects (LeBorgne, 2018). While there are many studies regarding the vocal health of CCM singers, there are very few of adolescent singers in this genre. One such study examined the voice quality in 45 high school singers at the start of their formal studies of singing in CCM genres provided at their school (Sielska-Badurek *et al*., 2017). They found that 22% of the students already presented with phonotrauma including vocal nodules prior to even beginning formal training, though the participants' self-reporting evaluation numbers using the SVHI and VHI to assess the

singing and speaking voice were within normal ranges and were significantly positively correlated ($r = .554$, $p < .01$). 60% of the participants showed supraglottic activity with compression of the supraglottic structures used in phonation, and 39% of the participants were found to have irregularities in the motion and tension of the vocal tract when singing using laryngeal videostroboscopy to examine the vocal mechanism.

Vocal quality changes are what make CCM voice production so unique, whereas classical singers tend to sing using consistent vocal quality throughout their range (Woodruff, 2011). The difference between classical and CCM vocal styles and approach to technique are discernible even when singing scales (Kayes & Welch, 2017). There are varying methodologies within CCM vocal pedagogy, a full explanation of which is beyond the scope of this study. The most prominent of which are the Estill Model founded by Jo Estill; the Speech Level Singing methodology created by Seth Riggs; Somatic Voicework created by Jeannette LoVetri, Voiceworks created by Lisa Popeil, Complete Voice Training (CVT) developed by Cathrine Sadolin, and the Vocal Power Method founded by Elizabeth Howard (Hoch, 2018). A more thorough examination of these techniques, their originators, and other impactful CCM vocal pedagogues can be examined in two recently published resources (Hoch, 2018; Naismith, 2019).

Traditional Folk Music. Vocal music is practiced in every known culture worldwide, and singing is a global phenomenon. The musics from around the world vary greatly in terms of sound ideals and often differ from Western classical vocal technique ideals (Bartolome, 2019). Music and the traditions of singing have been taught generationally from one person to another both aurally and orally since humankind began. It wasn't until more recent years that it was taught in higher education academia (LoVetri & Weekly, 2003). In some ways, CCM singing styles have also been taught this way. Just like in CCM genres, there are teachers that have

concerns that singing outside the Western classical vocal tradition will result in harm to the vocal mechanism (Shaw, 2012). Vocalists in both early CCM singing genres and traditional music were not trained in regard to breath support, singing with resonance, or belting, yet all three were developed and utilized in traditional and vernacular music from around the world in order to allow for the voice to travel in open-air settings or through a building (Woodruff, 2011). The tone colors can range from a light and silvery approach to sound to bright and brash, or a rich, dark sound (Bartolome, 2019).

Vocal stylistic techniques used in other cultures are largely ignored in the literature due to cultural considerations (Smith & Sataloff, 2013) as well as limitation regarding availability of the published literature. Some of the stylistic and vocal techniques used in folk and traditional music from cultures around the world are similar to those employed in the vernacular music that dominates popular culture. Music from around the world incorporates sounds such as shouts, phonation on inhalation, click, growling, noises, all of which can be produced in a healthy way but require skill and training (Woodruff, 2011). Singers change their vocal production and style when singing music from differing time periods such as the Baroque period contrasted with the Romantic. This same care and attention should be tended to when singing in non-Western traditions (Bartolome, 2019; Shaw, 2012; Sperry & Goetze, 2014). Yet music from non-European cultures were historically sung using Bel Canto technique (Sperry & Goetze, 2014), and in many cases are still performed that way today at the discretion of the conductor in the interest of healthy vocal technique. Literature shows that these concerns may have some merit. In a meta-analysis of dysphonia in singers, Pestana, Vaz-Freitas, and Manso (2017) found that singers of traditional music as well as popular music genres presented a higher level of dysphonia than those of classical genres.

In personal correspondence from Jeannette LoVetri to Matthew Hoch (2019), she stated "all over the planet you will find people singing music of their own country, and few of them have a very solid understanding of what the voice is doing or needs to do to stay healthy. There is no formal vocal health orientation in most world music, so performers are on their own to stay healthy" (p. xxvii). The three major differences in voice production for world music as compared to Western classical are the position of the larynx, registration of the voice, and resonance (Bartolome, 2019). Traditional folk music was and is typically performed in less than ideal acoustical settings or even outside. In order to be heard when singing outside or in dry acoustic settings, a bright, loud sound is used which is produced using a shortened vocal tract with a higher larynx (Hoch, 2019; Sperry & Goetze, 2014). This can be done over a wide range of pitches, though when done with higher pitches is known as belting. The pharyngeal space is smaller, which makes the vowels brighter and take less air to sustain, especially when combined with a lowered soft palate (Sperry & Goetze, 2014).

While the study of the vocal technique of all world music is beyond the scope of this study, recently published research has shown that many cultures use chest register or belt. There are many vocal traditions that are practiced around the world that fall outside of the Western classical vocal approach. Many African, Indian, and Arabic cultures utilize a raised larynx with a chest sound that is sung with a vocal belt (Bartolome, 2019). Mexican Mariachi singing, or ranchera, where singing is often outside and without amplification and therefore requires continuous use of chest voice. Vocal technique in this style demands robust breath management training, range expansion, easy onsets, and vocal production technique which includes guidance in accenting the "break" in the voice, or a yodel effect (Ulloa, 2019). Samba singers from Brazil use "shout singing" in either a head or chest register in order to be heard over the percussive

instruments (Mesquita & Howell, 2019). Unfortunately, according to the authors, they do sing to the point of becoming hoarse, which is considered normal in this genre. Many traditional Irish (Sean-nós, or "Old-style") singers use both chest and head voice, often singing with a mixed registration with minimal mouth movement, neutral tongue, lip, and jaw position, and intentional restricting of the airway by tilting the head. They often sing with a pronounced nasal quality, utilizing straight tone with an occasional use of subtle vibrato. This combination with additional use of glottal stops and the "stressed" timbre created was likely developed because of the need for distinctive voices that projected well for traveling street buskers (Joyce & Costello, 2019).

Lithuanian *sutartinė* singing is forceful, with dark vowels, aggressive diction, and characterized by loud singing that is strong, and uses the chest voice with little to no vibrato (Bartolome, 2019). Knight (2019) tells us that Georgian folk singers use what is referred to as a "natural voice", and intonation can feel jarring to someone trained in the Western tradition, as blend and intonation are not stressed or even addressed. Each voice part has a characteristic sound, with the top and middle voices being reedy and nasal, and the basses singing in pure chest voice. All use straight tone, especially in their tonal dissonances, and singing is taught to be confident, full-throated, and with abandon. The voice can sound tense or strained, especially female voices. In some areas, *krimanchuli* yodeling is employed. In other styles such as *cantu a tenòre* features the lowest voice using a gravelly and raspy hum which creates undertones, though it is thought to do damage to the voice and may hurt the singers' opportunity of singing in any other way.

Traditional South African singing is often done with a forward-placed tone using a full-voice with a strong chest register. There are often ululation sounds, or a high pitched, improvised sound that can be noises, clicks, pulsating wail, or sometimes a howling sound. It is used at

particularly high emotional moments or at the climax which add to the character of the emotion or the work (Barrett, 2019). Istibili singing in South Africa is known for its full, resonant sound with a vibrant timbre combined with physical movements such as shuffling, sliding, stamping, moving the feet, different body positions, shoulder movements, and hand gestures. Vocal blend is not the goal in this style (Gibson, 2019). Overtone singing, or throat singing, uses the vocal tract to create a mathematical overtone series with the additional use of the vestibular folds, or false vocal folds. It has been used in Eastern cultures such as Tuva, Mongolia, and Tibet, and are usually male singers. In South Africa Xhosa tradition, women are the ones who are overtone singers in the style *umngqokolo* which Rachele (2019) says literally translates "to sing in a hoarse, bass voice, in the back of the throat, with the mouth open" (p. 390).

The technique used to produce these sounds differ greatly. In some cultures, the oral cavity is wide, and almost horizontal, with the corners of the mouth closer to their cheeks and teeth held closely together (Sperry & Goetze, 2014). The chest voice is used extensively, even in the upper part of the vocal range, and women's vocal ranges are typically lower than in Western classical singing (Sperry & Goetze, 2014). Generations of singers in many traditions sing daily in their chest voice without vocal harm, perhaps because they have developed the musculature to do so over a period of time (Sperry & Goetze, 2014). Some cultures value varying colors of nasality, using more of the naso-pharynx in order to allow the sound to resonate, and lowering the soft palate (Sperry & Goetze, 2014). Asian cultures often prize vocal timbres that are brighter and more nasal, using a raised larynx and shorter vocal tract (Bartolome, 2019). Some cultures utilize special techniques such as bleating, yodeling, harmonic singing, or ornamentation, all of which are done using principles contrary to Western classical vocal technique (Sperry & Goetze, 2014). Bulgarian singing is known for a dark sound that is produced with a rounder resonance

space toward the back of the pharynx (Bartolome, 2019). Despite all of these techniques that may seem contrary to what many consider healthy, choirs from around the world often change their vocal technique in order to change their tone, sound, or vowel shape and showcase healthy singing outside of the Western classical vocal approach when singing the music of varying cultures and ethnic groups (Bartolome, 2019).

Kenyan Vocal Pedagogy. There are fifty-five countries in the continent of Africa, and each country boasts of many cultural communities. While some vocal and musical aspects are similar between African nations, many are unique to a particular region, nation, or even cultural community. Eastern Africa, where Kenya is located features a blend of indigenous, Christian, Arabic, Indian, Islamic, and other African influences and sonorities (Hoch, 2019). Singing is integral to the daily life of Kenyans who sing in public, private, rituals, and with their families. They often sing to pass time or for entertainment with their friends. Children begin singing as soon as they can form words, and continue to do so for life (Senoga-Zake, 1986). Choral singing is prevalent throughout the African continent, particularly in South Africa which offers a rich choral tradition (Hoch, 2019). It is important in Kenyan culture as evidenced by the National Music Festival which focuses on the Western choral and traditional folk music tradition. Students from throughout the country participate annually in this large competition and festival which is mandated by the government of Kenya. It begins at a local level, and the top five scored performances in each category move on to the next regional level to compete, with only the best going through to the National Festival. Western music (set pieces) and traditional folk music and dances are adjudicated.

Folk singing is cherished because it is the indigenous music that represents the culture of each of the forty-two cultural communities present in Kenya. George Senoga-Zake (1986) states

that folk singing celebrates courtship, marriage, childbirth, circumcision, manhood. It is used in daily life with lullabies, field work songs, songs for canoeing, grazing, praise, watering and feeding animals, drinking songs, and songs to teach children. Folk songs are also used for discussing war, death, in funerals, to signify scorn, and to call for a change in the weather. Folk songs in Kenya are primarily sung in unison and/or octaves, though some ethnic groups do utilize polyphony and harmony that is native to their community (Senoga-Zake, 1986). Many cultural communities are similar to the Luo, whose songs are performed by a leader and the chorus (Omandi, 1980). This practice is common in sub-Saharan Africa, but the "chorus" is anyone present, not necessarily a formal chorus in western terms (Yang *et al*., 2015).

The primary text used by teachers, *Folk Music in Kenya* by George Senoga-Zake (1986) overviews different styles and songs performed in traditional Kenyan cultural communities. According to Senoga-Zake singing in Kenyan folk traditions is often done loudly and using full voice, which can sometimes be perceived as noise, especially when women include the shrieks and high trills which indicate high emotion. He states that breathing is done as needed without interfering with the rhythm of the song. There are no set keys for songs. The tonal center is established by the caller, or soloist and what is comfortable for them. Senoga-Zake explains that in the Neo-folk music movement, chordal singing is done using triads on the tonic, subdominant, and dominant chords, and is very rhythmic. Sometimes harsh, rhythmic, guttural sounds are used to accompany the melody in place of instruments or choral structure, such as with the Maasai, one of the cultural communities. These guttural sounds are produced using a harsh, deep, glottal attack that is contrary to Western classical technique and more similar to CCM styles. In fact, Senoga-Zake explains that "vocal production is not so important as the song itself" (p. 8), and that singers often "screech themselves hoarse" (p. 12). He reiterates that the tone that is most

prized is very harsh and rough. Dance almost always accompanies singing, and feature bodies moving in time with the drums, with movement of the head, shoulders, and legs are multi-rhythmic.

Though music and music education are very prevalent in Kenya, there are very few studies regarding vocal studies (tuition) in Kenya. In 1964, Hyslop surveyed music education in Kenya and found that technical exercises, breathing, and voice production exercises were taught mechanically and without connection to appropriate literature, and that the teaching of singing in primary schools was insufficient. One study by Andang'o (2000) provides the only other insight found that was published on the topic of vocal pedagogy in Kenya. According to Andang'o, Africans do not necessarily think of the voice as an instrument, but merely an extension of what it means to be human. Through a study of the literature on the voice, Andang'o (2000) identified eight goals of vocal music education or vocal tuition: Functional freedom to free the student from all inhibitions (Reid, 1971); vocal freedom for correct usage of the vocal mechanism that allows for power, natural beauty, and ease (Andang'o, 2000); that voice teachers should have knowledge and respectability, as the incorrect voice teacher can ruin a students' voice (Christy, 1969); correct vocal registration and tone quality is guided by the teachers, who need to take great care (Bennett, 1986); voice teachers should take their role seriously, offering advice, instruction, or even incentives (Horton, 1974); there should be a lack of ignorance regarding the mutation of the voice, particularly in changing boys' voices (Swanson, 1973); voice instructors should have the ability to impart "aesthetic sensitivity" to their students in order to guide them on the meaning and pleasure of singing through interpretation and expression (Christy, 1969; Hoffer, 1964); and finally, voice teachers should self-evaluate and improve on their ability to

communicate interpretation, technique, understanding, and feeling when training voices so that a free and beautiful tone is produced by their students (Hoffer, 1964).

Andang'o reiterates the beliefs of vocal pedagogue Richard Miller that voice instructors should have a solid foundation combined with the ability to communicate technique and interpretation by demonstrating a stable and constant body of factual knowledge, to have a growth mindset and flexibility toward change, and an artistic imagination combined with excellent musicianship skills themselves (Miller, 1986). She states that the basics of vocal tuition include good posture (Christy, 1969); rudimentary foundations of breath intake that include relaxed and deep inhalation, suspension of the breath, exhalation or phonation by attacking the tone, and recovery prior to beginning another breath phase (Christy, 1969; Reid. 1971); resonance that employs the singer's formant with "ring" to the voice (Reid, 1971) and balance between vocal registers; clear diction that allows for words to be understood clearly (Christy, 1969); and some voice science instruction as it relates to vocal anatomy in order to increase the standards of singing. Andang'o implies that this approach will help students to attain vocal independence, musical performances, and a positive attitude.

This insight is invaluable, and also implies that vocal study in Kenya is also based on a Western classical vocal approach. There is some apathy toward voice tuition in certain universities Kenya as evidenced in practice, performance, and the level of musicianship within the student population specifically as it relates to resonance, articulation, breathing, and attack (or vocal onset) (Andang'o, 2000; Mochere, 2017). Elizabeth Andang'o's study (2000) sought to understand why voice students at Kenyatta University were apathetic toward their vocal education and seemed reluctant to put forth the effort to improve. She specifically analyzed what standards were in place in the most prominent university to study music education, the level of

awareness of the standards by the student population, the extent to which students achieve the set standards, and the role of the voice tutors in the process.

The results of this study shed a light on voice study in Kenya. Of the 44 voice students, 47% chose voice because they did not play other instruments or it was considered easy, and only 20% did so because they loved it or preferred the voice over other instruments. Most of the students have no love for singing, and only do it to pass their examinations since they couldn't play an instrument. Kenyan musicians are expected to be good singers because of the fact that they grow up with singing, therefore it is not a skill to be overly concerned with. Very few students studied the voice formally prior to university. Seventy percent of students only had studied voice just prior to their Certificate of Secondary Education exams, and only 27% had experience through other avenues such as the National Music Festival. Only 23% of the voice majors felt that extensive training was needed for the voice, with 43% believing that anyone can sing, it is a convenient instrument, or it should not be a major. When asked about their voice teachers, 61% of voice students valued encouraging, confident, and pleasant, teachers who had a good sense of humor. Knowledge of the disciple was not listed as a desired quality.

Fifty-five percent of voice students had never performed their class songs in front of an audience for reasons of feeling unprepared, fear, absence of vibrato in their voice, lack of motivation, or in some cases lack of opportunity, and only 5% of voice majors sang in the choir. Sixty-eight percent of students desired more thorough vocal tuition in terms of vocal technique, breath, expression, and widening the range. Two percent also wished for training in CCM genres such as rhythm and blues and hip hop. The majority of voice instruction is taught by rote with little to no sheet music or resources, which is also true in primary school (Akuno, 2015). A good

singer was defined as one who "produces sound freely, with proper resonance" (Andang'o, 2000: p. 57).

There are some challenging factors that hinder the participants' desire to grow musically such as music which features excessive chromaticism, excessive ornamentation, extremely high or low ranges within the music, complex rhythmic patterns, text that seemed irrelevant to their lives, particularly in foreign languages, as well as the length of the song that they are learning. Because they learn by rote memorization, longer songs are more challenging to memorize.

Of the five voice instructors at Kenyatta University at the time, the most important aspects of vocal instruction, or tuition were diction, articulation, breath control, phrasing, expression, musicality, vocal projection, performance practices, warm-ups, vocal exercises, and range extension. Only diction and breathing were named by three of the five voice teachers, implying that the voice instructors have varying goals. Voice instructors named several challenges such as lack of piano skills, low musicianship skills of the students combined with an apathetic attitude, lack of time for instruction, out of tune pianos, few resources, and a high student to teacher ratio. According to Andang'o, the ideal voice instructor is able to teach functional freedom of the voice with a pure tone quality, understands the function of the vocal folds and the throat and mouth cavities to attain resonance, understands the coordination of the muscles involved ion singing, and can effectively communicate this to their students, and one that is inquisitive and has a growth mindset to help their students attain good posture, breathing, resonance, and diction, and then helping their students find meaning in the text. Andang'o states that the student success is largely based on the ability or willingness of the teacher, or at the very least the inability of the voice instructors to communicate their goals effectively. She suggests more performance opportunities, more involvement in choirs, more diversity in genres taught,

the development of a curriculum to bridge secondary school to university, and the addition of a vocal pedagogy workshop or class for students. Though there is only one study that this researcher was able to find on vocal pedagogy in Kenya, based one university, and that it is 20 years old, these findings provide valuable insight on vocal pedagogy principles taught in Kenya.

Choral Pedagogy. Choral music is thriving worldwide as evidenced in choral festivals such as the World Choir Games, which is scheduled to host 23,000 choir members from 74 countries in 2020, a significant increase from the 2018 Games hosted in South Africa which hosted an impressive 44 different nationalities (Interkulter, n.d.). According to Bartolome and Campbell (2019) there are approximately 69.6 million men, women, and children singing in over 1,270,000 choirs in Europe and the United States alone. People of all ages are choosing to join together in singing communities by singing in their place of religious worship, school, a cappella, community, workplace, or even more unlikely places such as prison, homeless shelters, hospice center, or even their local neighborhood bar with the popular "beer choir" (Bartolome & Campbell, 2019). The practice of choral pedagogy is grounded in the traditions and theories of Western, classical vocal technique in music education settings (Kirsh *et al*., 2013; Shaw, 2012). A concern has been expressed by some choral music educators that singing music in styles using techniques other than the Western classical approach may result in damage to the vocal mechanism (Shaw, 2012). That may be because the choral culture of today was derived from European and English models, and has been largely influenced by two ideals in the last century: The "St. Olaf tradition" which was developed by F. Melius Christensen at St. Olaf College in 1912, and is known for its pure, transparent, straight tone; the "Westminster tone" as developed by John Finley Williamson and Westminster Choir College in 1920 features a darker, heavier tone with more encouragement toward a soloistic style of singing (Smith, 2018b).

Choral music is not immune to the scrutiny of vocal technique. Famous choral conductor Howard Swan experienced voice disorder in 1933 and then became a strong advocate for a vocal pedagogy geared toward choral singers and conductors by partnering with those in the newly developed field of voice science as well as vocal pedagogues (Smith, 2018b). There is debate within otolaryngologists and vocal pedagogues on the demands of choral singing, as it is believed to also have unhealthy singing traits. Some choral techniques create laryngeal strain, requiring regular singing outside of the tessitura (comfortable singing range) of a vocalist, singing with extreme dynamic contrasts while trying to blend their individual voice to the ensemble, and creating vocal fatigue by singing with a straight tone, or that of little frequency variation as possible or vibrato, over long periods of rehearsal (Kirsh *et al*., 2013). Voice teachers often state that the behaviors needed for singing in the choral genre such as singing too softly in order to blend with others (Ternström, 1991), singing for long periods of time with a straight tone (Kirsh *et al*., 2013), singing for long periods of time outside the comfortable pitch range and the laryngeal strain that it produces (Appelman, 1967; Cooper & Diehl, 1973; Meyerson, 2003), and oversinging in order to help carry a section (Middendorf, 2007) can cause strain or dysphonia over time.

Singing in ensembles, particularly for younger choral singers can create vocal fatigue for a variety of reasons (Tepe, 2002), though it is believed that experienced choir members are usually aware when there is an issue in their voice (Rosa & Behlau, 2017). In order to achieve vocal blend, choral singers must match loudness, pitch, vocal timbre, have vowel uniformity, precise diction and consonant placement, articulation, unified vowel modification as needed, and a unified resonance (Decker & Herford, 1988; Ternström, 1991). Choral pedagogy expert Brenda Smith (2018b) stated that ideally, choral rehearsals begin with a structured warm-up which

"adjust the posture of the vocal folds from speaking tasks to singing ones" (p. 295) by following a specific order of physical warm-ups to encourage relaxation, attention to posture or alignment, breathing exercises, and resonance exercises (Smith, 2018b). Other vocal experts agree, and state that after beginning with physical and breath warm-ups, conductors should continue with gentle initial phonation exercises which are descending, using semi-occluded exercises such as lip trills, tongue trills, and singing on an [u] vowel (which sounds like "ooo" or [u]), then adding range extension exercises, consonant and diction exercises, and ending with ear-training exercises (Napoles et al., 2012; Titze, 2008). Warm-ups should separate vowel shapes from consonants so that singing can occur on the breath (Smith & Sataloff, 2003). Following rehearsal with vocal cooldown exercises is also very important for vocal health (Smith, 2018b).

Proper posture and alignment allow for the efficient use of the musculature used in inspiration and expiration, and therefore ease the effect of tension on the laryngeal muscles (Smith & Sataloff, 2003). An important aspect of a healthy choral tone begins with the conductor inviting the choir to breathe with a unifying gesture for breath, and encouraging "singer's breath" throughout singing with a relaxed and low gesture that initiates singing from the core (Smith, 2018b). Leon Thurman (1983) wrote that the ideal healthy tone for choral singing should have:

> an ideal balance between airflow energy and necessary muscle energy. As the coordination becomes increasingly efficient, the resulting tone quality will be firm and solid but mellow and rich. There will be no audible indication of squeeze, muffle, edginess, or habitual breathiness in the entire developed pitch range, nor will there be any sudden changes in tone quality because of register transitions. That tone will be both beautiful and healthy. (p. 27)

In rehearsal, separating text and the learning of the music allows singers to sing with greater ease rather than risking vocal injury that can occur with the likelihood of jaw tension, and neck tension that often occur with inexperienced singers when both are combined (Kirsh *et al*., 2013, Smith & Sataloff, 2003).

Some studies show that vocal disorders are also prevalent for choral singers. One research study of 196 participants in the World Choir Games in 2012 found that 31% of the participants reported vocal fatigue after choral singing activities (Kirsh *et al*., 2013). Choral contemporary a cappella singers experience heavy vocal loading, and have a higher risk of having vocal disorders with up to 87.5% reporting vocal difficulties (Baird *et al*., 2018; Watts, 2016). As in other genres, studies show contradictory evidence. Koufman *et al*. (1996) found that college-level choral singers, especially those with more formal training, had much less muscle and laryngeal tension when they sing. A longitudinal study with a large sample size (N = 1,495) of children aged 8 to 14 in Spain studied the vocal health of trained choral singers (n = 752) and non-singers (n = 743) over two and a half years as they sang for 7.5 hours per week. They used stroboscopic evaluation combined with self-reporting measures, and found that voice disorders were significantly more common in the sample that did not participate in a choir (32.4%) than those who sang in chorus (15.6%) (Clarós *et al*, 2019). Vocal fatigue can occur for choral singers if rehearsals are too long, when performances are very close together, when repeatedly singing passages that are outside the comfortable singing range, especially on sustained pitches or extreme dynamic ranges (Titze, 2007; Thurman, 1983).

Comparison of genres. A comparison of the historical treatises regarding the practices of Bel Canto singing and the pedagogical practices encouraged in CCM singing showcases that the foundational principles of breath, onset, and resonance do are different but correlate at times

(Winnie, 2017). In *Teaching singing in the 21st century,* Kim Chandler created a chart comparing the vocal techniques used in classical and contemporary genres (Table 2.2).

Table 2.2.

Fundamental differences between classical, contemporary, and Kenyan traditional music

Issue	**Classical**	**Contemporary**	**Kenyan**
1. Posture	Static/dramatic action (opera)	Dynamic/movement to beat	"Proper posture" that allows for movement
2. Breathing	Long, legato phrases	Shorter phrases (conversational)	Done as needed, so as not to interfere with the story
3. Onsets	Simultaneous, balanced, coordinated	Glottal, aspirate, 'scoops', 'creak', 'cry'	Glottal attacks are common
4. Larynx position	Neutral/lowered	Neutral/raised	Raised
5. Sung tone	Pure, 'trained' tone	'Naturalistic' tone	Loud, pressed tone
	(Women) use of 'head' voice	'Chest' voice (for both genders)	(Women) use of shrill shrieks
	'Sob'/'Cry' quality	'Mix' & 'Belt' quality	Chest voice, dark
	'Covered' tone	Sometimes 'twangy' (or strident)	Guttural at times, harsh, and rough
6. Diction	Italianate vowels	Americanised vowels	"Round" vowels for Western
	All consonants pronounced	Initial consonants are emphasized, ending consonants de-emphasized	"Open" vowels for traditional
7. Sung Accent	English (R.P.) or various European accents	Generic, Americanised slang or vernacular	English (R.P.), Kiswahili, or various cultural-community dialect
8. Rhythm	Unsyncopated ('straight'), rubato	Syncopated, specific to 'groove'	Complex, three against two
9. Vibrato	Heavy	Light	When singing "properly"
10. Pitch (scales used in vocal melodies)	Traditional diatonic scales used, Chromatic	Hexatonic scales such as the Blues, Pentatonic scales, Modes	Pentatonic

Table 2.2. (Continued)

Issue	Classical	Contemporary	Kenyan
11. Vocal harmony	Reading parts	Intuitive parts, i.e. 'by ear'	Unison in most traditional singing
	SATB voicings, specific harmonic rules	Triadic, added-note chords	Triadic in Neo-folk music
12. Range	Italian voice classifications	Generic male and female ranges	Performed in any key that is comfortable to the caller, or soloist
13. Agility	Diatonic/chromatic coloratura	Pentatonic/hexatonic melisma's	Ornamentation is common
14. Musicianship	Classical theory	Popular Music theory	Oral/Aural rote tradition
15. Improvisation	Cadenzas, avant-garde music	'Ad libs', 'riffs', 'runs' are improvised	Every performance is different because the soloist, chorus, and audience add improvisational sounds
16. Paralinguistic Vocal 'effects'	Only generally found in extended vocal techniques (avant-garde)	Vocal distortion, growls, grunts, moans, aspirate endings, etc can be used	Guttural, harsh sounds, shrieks, trills, ululation
17. Visual	Formal attire, costumes (opera)	Informal, smart casual dress	Traditional attire for cultural community, coordinated formal attire, or informal casual
18. Performance Venue	Formal, early evening performances	Informal, late evening performances	Informal performances, inside and outside
19. Amplification	Technique designed for unamplified singing	Performances always amplified. Microphone technique important	Often performed without amplification
20. Vocal Health Issues	Competing with live orchestral accompaniment. Loud, acoustic singing practice in small practice rooms	Loud, amplified singing in competition with loud, amplified instruments, bad monitoring, hearing damage, lifestyle issues	Loud singing in extreme ranges; harsh, guttural vocal production

Reprinted with permission from Chandler (2014, p. 37)

The table is presented with an additional column added for Kenyan vocal pedagogical practices as presented by the literature reviewed.

Implications for voice disorders

Physiological aspects of singing. There are factors that affect the voice beyond vocal technique such as acid reflux and heartburn, allergies, stomach problems, sore throats, reoccurring cough, a constant throat tickle, throat clearing, and even stress. These stressors can have a negative impact on the function of the vocal mechanism. Within the realm of vocal health research, contradictory studies have also indicated that vocal training has no impact on the prevention of dysphonia (Hazlett *et al*., 2011). Research suggests that there may be other factors such as genetic implications that cause vocal dysphonia (Simberg *et al*, 2009b). Other considerations such as the overuse or abuse of the speaking voice (Renk *et al.*, 2016), dehydration (Baken & Titze, 2017), stress (Holmqvist *et al*, 2013), and even acid reflux (Lloyd *et al*, 2017) are known factors that can cause physiological issues in the voice. These factors are believed to have an impact on the vocal health of singers, regardless of vocal training.

Vocal Loading and Fatigue. Vocal loading is defined as the physical demands that are placed on the vocal mechanism at greater than average levels and can lead to vocal fatigue or even vocal disorder (Titze, 1999; Vilkman, 2004). It is a term used to describe the duration of phonation time, pitch, and loudness (Vintturi *et al*., 2001). There has been some indication that the vocal mechanism can adapt to vocal loading, possibly because of improved blood circulation in the muscles of the laryngeal mechanism which leads to a lowered viscosity of the vocal folds, and therefore improved mobility (Titze, 1994). Vocal loading can be measured with a dosimeter. There is currently a need for more research on vocal loading in singers, as the amount of vocal

dosing varies greatly in speaking and singing tasks as well as genre (Laukkanen et al., 2004; Phyland, 2017; Phyland *et al*., 2013).

Overuse and vocal loading can lead to vocal fatigue, which is defined as a change in vocal quality that results after continuous voice use over a period of time (Sataloff, 1997). Vocal fatigue worsens throughout the day with usage, and is apparent with changes in pitch, effort level, or intensity, and often has disappeared by the next day (Schwartz, 2012). Repeated vocal fatigue over time or overuse and abuse of the voice is called phonotrauma, or vocal abuse and can lead to vocal disorder.

Professional voice users. Professional voice users are particularly susceptible to voice disorders. A professional voice user was defined as one whose profession, either in part or in full, depends on their ability to use their voice (Vilkman, 2004). Teachers are considered professional voice users because of the daily and often uninterrupted usage of their voices (Titze *et al*., 1997). Educators have a significantly higher rate of vocal complaints which are cumulative and worsen over time (Chitguppi *et al*., 2019; Roy *et al*., 2004; Smith *et al*., 1997), particularly those whose vocal folds vibrate for 2-3 hours per day often experience vocal fatigue (Titze, 2008). Teachers are as much as five times more likely than non-teachers to seek out voice therapy, representing between 5.2% and 20% of the patient load (Roy *et al*., 2004; Titze *et al*., 1997). Issues such as hoarseness, throat discomfort, vocal fatigue, voice loss, and other vocal disorders are the primary reported concerns of educators (Mattiske *et al*., 1998)

Singers. In a meta-analysis of the vocal and laryngeal pathologies found in professional singers of all genres and worldwide, Kwok and Eslick (2019) found that singers are at a higher risk of vocal pathology symptoms. Singers tend to be more sensitive to the nuances of their vocal mechanism, and seek out medical attention sooner than and at a higher rate than non-

singers (Phyland *et al*., 1999). Because of this, they self-report vocal disorders at a higher rate than non-singers (Pestana *et al*., 2017). Studies show that singers represent up to 11.5% of patients seen for voice consultation, as opposed to 0.02% to 0.22% of the general non-singing population who seek treatment (Pestana *et al*., 2017; Titze *et al*., 1997). Of these singers, it is estimated that 71.9% of them are professional voice users whose livelihood is dependent upon their vocal use (Pestana *et al*., 2017).

No genre is immune to potential voice disorders in its singers. Studies have found that up to 87% of students who train classically have suffered from at least one symptom of dysphonia due to misuse of the voice, including reduced vocal range, vocal fatigue, hoarseness, dryness in the throat, throat discomfort, or throat pain (Sapir, 1993). In a study of professional opera singers from around the world, 37% of the 46 participants had experienced vocal injury or ailments, usually related to allergies, acid reflux, vocal fatigue, hoarseness, illness, or laryngitis (Cupido, 2016). Choral singers specifically are reported to have high levels of vocal fatigue (Kirsh *et al*., 2013). In one study of 315 semi-professional adult choral singers in Finland and Sweden (Ravall & Simberg, 2020), 21% of those choral singers regularly experienced two or more common vocal symptoms (including frequent throat clearing, coughing, voice becomes strained or tired, lump in the throat sensation, hoarseness, difficulty being heard, and there are breaks in the voice). Because the singers had two or more regularly occurring symptoms, they were defined as having a functional voice disorder (Holmqvist *et al*., 2013; Ohlsson *et al*., 2012; Simberg *et al*., 2009a; Simberg *et al*., 2009b). Another study shows that 17.9% of choral singers seek treatment from an ENT or otolaryngologist, and 9.9% of choral singers seek voice therapy from an SLP (Rosa & Behlau, 2017).

Teachers of singing. If professional voice users who use their speaking voice for a living and singers who use their singing voice for a living are more susceptible to phonotrauma and abuse, then those who do both such as voice teachers and choral directors are even more vulnerable. Teachers and singers are the most reported professions to seek out medical treatment from an otolaryngologist or voice therapy from speech-language pathologists (Titze *et al*., 1997). Some of the worst damage to the larynx has been found in voice teachers and choral directors as reported by voice therapists (White, 1976). Music educators have been found to have up to four times more prevalence than teachers of other subjects (Morrow & Connor, 2011a; Morrow & Connor, 2011b).

Sixty-four percent of professional voice users who teach singing reported having an issue with their voice at some point (Miller & Verdolini, 1995). The profession of choral music education specifically has been found to be harmful to the vocal health of conductors (Schwartz, 2009). Choral directors are more at risk for developing vocal disorders because of the fact that they regularly sing or talk over the piano and the choir's singing (Smith & Sataloff, 1999). They may also speak over other ambient noise, such as the echoes of instrumental music from a nearby band or orchestra room, and frequently model a desired vocal tone, vowels, correct pitches, articulation, or vocal technique (Baker & Cohen, 2017). Choral directors who routinely display vocally abusive behaviors such as consistently singing over their choir or regularly sing outside their comfortable vocal range, or tessitura are more susceptible to symptoms of dysphonia such as consistent hoarseness, vocal fold injury, nodules, or even permanent damage to the vocal mechanism (Schwartz, 2012). Acoustic analysis of choral directors' voices showed that choir directors have tend to have smaller vocal ranges and speak with less intensity, and also display less control over their control over intensity than the normal population or that of trained singers

(Schwartz, 2009). Care of the professional voice in either a speaking or singing capacity requires special care, which is even more important when one is expected to do both!

Vocal Hygiene. Vocal hygiene can be described as the understanding of the vocal mechanism, its anatomy, physiology, and how to care for this delicate instrument. Vocal hygiene is an important part aspect of vocal pedagogy courses in higher music education at many universities in the United States. One aspect of vocal hygiene is the care of the voice with aspects such as sufficient sleep and hydration. Hydration can be through water intake and through other sources such as humidifiers and steam inhalation (Alves *et al*., 2019). Systematic hydration and its' benefits are well documented in the literature for voice care (Achey *et al*., 2016; Alves *et al*., 2019). Hydration is a common and basic principle for maintaining a healthy voice as professed by voice teachers and the medical field (Achey *et al*., 2016; Behlau & Oliveira, 2009; Murry & Rosen, 2000; Timmerman *et al*., 2005). Without sufficient hydration, the mucosal wave is affected because of the lack of viscosity in the mucus (LeBorgne, 2019). The respiratory tract should be coated with a thin layer of moisture or mucus, which allows for lubrication for vocal fold vibration and helps fight of upper respiratory infection. When dehydrated, singers will experience a reduced flow of this healthy mucus, and it will become thicker and affect vocal ability (Thurman, 1983). Dehydration can occur with digestion, consuming diuretics (especially caffeine and alcohol), perspiration, breathing in dry air, and certain medications such as antihistamines (Alves *et al*., 2019; Bhavsar, 2009; LaPine, 2008; LeBorgne & Rosenberg, 2014; Thurman, 1983). Hydration is considered by most otolaryngologists, speech and language therapists, and voice teachers as a primary aspect of healthy vocal function.

In addition to hydration, vocal rest has been linked to overall vocal health (Yiu & Chan, 2003). Conductors should give frequent breaks for voice rest and silence, allow their students to

stretch, and encourage vocal rest as often as they can, especially after long or strenuous rehearsals (Thurman, 1983). Another important aspect of vocal hygiene is the reduction of stress in a singers' life. Stress reduction improves overall vocal health and performance (Achey *et al*., 2016; Behlau & Oliveira, 2009; Murry & Rosen, 2000; Timmerman *et al*., 2005).

Abusive behaviors. Vocal hygiene principles also entail what behaviors not to engage in, or substances to avoid that can potentially harm the voice such as tobacco usage, caffeine and alcohol intake, certain medications, and other environmental concerns such as smoky or dusty, environments. Medications such as antihistamines, decongestants, certain pain medication, and anesthetic lozenges are harmful because of their dehydration properties or numbing of the vocal mechanism. Additionally, alcohol and tobacco smoke dehydrate the vocal folds (Davies & Jahn, 2004b; LeBorgne, 2019). Alcohol has a systematic drying effect on the vocal folds and increases chances of acid reflux as a result of the acids (LeBorgne, 2019). Smoking cigarettes produces enormous amount of heat over the oral mucosa and vocal folds, plus has the negative effects found in the carcinogens in both nicotine and tobacco (LeBorgne, 2019) and produce more risk for developing vocal dysphonia or disorders (Simberg *et al*., 2015).

Other vocal behaviors that can cause harm involve the use (or overuse) of the voice. Habitual behaviors that are repeated over time such as throat clearing, yelling, coughing, talking in a noisy environment or in crowds, and shouting (Behlau & Oliveira, 2009; Murry & Rosen, 2000; Timmerman *et al*., 2005; Sapir *et al*., 1996). In general, excessive vocal intensity (loudness) causes strain on the vocal mechanism and its musculature (Sataloff & Titze, 1991). An example of this would be talking and singing over excessive background noise (Smith *et al*., 1998) or speaking or singing out of range, stress, body tension, talking over noisy environments, and speaking and singing outside of the natural vocal range can affect the interarytenoid muscles

within the larynx that control the mass, length, and tension of the vocal folds as they adapt for changes in loudness, pitch, and quality (Smith-Vaughn *et al*., 2013). These behaviors can lead to hyperfunctional dysphonia, which may then cause vocal fatigue and other more serious voice disorders has certain markers such as an elevated larynx, intensely adducted vocal folds, constricted pharynx, and often medialization of the ventricular folds, or false vocal folds (Stemple *et al*., 2000).

There are additional factors that can cause issues with the voice such as genetics and aging (Roy *et al*., 2004; Russell *et al*., 1998; Sataloff, 2001; Smith *et al*., 1998). Some studies indicate that sex can play a role in prevalence for vocal disorder (Fritzell, 1996; Russell *et al*., 1998; Roy *et al*., 2004; Smith, Lemke *et al*., 1998; Smith, Kirchner *et al*., 1998). Females are more prevalent to report issues with the voice (Fritzell, 1996; Gotaas & Starr, 1993; Roy *et al*., 2004). Medical conditions such as allergies (Roy *et al*., 2004; Simberg *et al*. 2009a) and asthma (Raval & Simberg, 2020) have an impact on healthy voice function. One widespread condition is acid reflux (GERD) and/or Laryngopharyngeal Reflux (LPR) (LeBorgne, 2019).

GERD is the reflux of digestive enzymes, acids, and other stomach contents into the lower portion of the esophagus, and heartburn is a side effect. LPR is a reflux that also affects the upper esophagus and into the throat, and is often hidden as its symptoms are subtler. Some side effects to look for are a continuous feel of a lump in the throat, the constant need to clear the throat, post-nasal drip, it takes longer to warm-up, the voice is worse in the morning, and perhaps a loss of high frequency pitches in the vocal range. 10-20% of the Western world are believed to be diagnosed with reflux disorder (Dent *et al*, 2005). Singers are at greater risk for GERD (Gastroesophageal Reflux Disorder) because of performance stress and pressure in the abdomen when singing (Davies & Jahn, 2004a; Kwok & Eslick, 2019; Ravall & Simberg, 2020). Antacid

usage is recommended for singers (Behlau & Oliveira, 2009) even if they do not have obvious symptoms because it can lead to permanent changes in the esophagus or larynx if untreated.

Another factor that can produce vocal trauma is speaking or singing all day without the use of a microphone can cause overuse of the voice which can lead to fatigue or even trauma (LeBorgne, 2019). This is easily addressed with vocal training of the mechanism. Vocal training is generally thought to lower risk of voice disorders in singers, particularly over time and with a teacher who has a thorough understanding of the vocal mechanism (Timmermans *et al*., 2005; Smith, 2018; Watts, 2016). Anatomy and physiology of the voice and vocal hygiene training varies across vocal programs worldwide. One study showed that 67% of the professional opera singers surveyed ensured that they had proper rest, hydration, avoidance of alcohol, smoke, or dairy products; meditation or yoga with breathing exercises, regular exercise, and a warm-up routine early in the day, as well as other routines designed to reduce stress prior to a performance (Cupido, 2016), whereas 37% of semi-professional choral singers in another study ($N = 315$) stated that they had limited or no knowledge of vocal anatomy and physiology of the voice, and 68% of that sample had little to no knowledge of Speech-language pathology and voice treatment (Ravall & Simberg, 2020).

Pathology and clinical implications. Pathology is the term used to describe the science behind the cause and effect of disease or the typical behavior of said disease. Signs of pathology And common side effects of abusive behaviors over time include hoarseness, breathiness, loss of range, loss of vocal flexibility, or vocal production that is unreliable (Kwok & Eslick, 2019; Smith & Sataloff, 1999). Other effects include breaks in the voice, throat pain, excessive throat clearing, overly tight neck muscles, vocal fold hypermobility, muscle tension dysphonia, Reinke edema (swelling of the vocal folds), chronic cough and irritation, feeling of a lump in the throat,

vocal fatigue, strained voice, trouble being heard, bowed vocal folds; vocal nodules, vocal cysts, vocal polyps, scarring on the vocal folds, vocal fold hemorrhages, or paralysis (Cooper, 1996; Kwok & Eslick, 2019; Ravall & Simberg, 2020; Thurman, 1983). Hoarseness is the most commonly reported reaction to long-term vocal issues in choral directors (Sataloff & Spiegel, 1991), and singers are twice as likely to experience hoarseness of the voice as compared to non-singers (Kwok & Eslick, 2019). Hyperfunction is another common sign of pathology. While Hyperfunctional dysphonia, a voice disorder characterized by elevated larynx, intensely adducted vocal folds, constricted pharynx, and often medialization of the ventricular folds, or false vocal folds (Stemple *et al*., 2000) is similar in vocal function to belting with its' high laryngeal setting, constricted and small hypopharyngeal width, and epilaryngeal opening, it differs significantly because of the wider jaw and lip opening of the singer combined with a significantly larger opening of the oral cavity, creating a "megaphone shape" within the vocal tract (Saldias *et al*., 2019). These factors may prove to take tension off of the vocal mechanism.

Vocal nodules and other forms of phonotrauma are signs of overuse and abuse of the voice which includes frequently singing outside of their comfortable singing range or overuse of the speaking or singing voice (Levine, 1994). Pre-service voice students, especially those who have been primarily self-taught with no formal training are likely to exhibit signs of vocal pathologies and organic lesions such as nodules or cysts even prior to entering formal vocal education programs (Nacci *et al*., 2019). Diagnosis of these issues is provided by Ear, Nose, and Throat Specialists (ENTs), also referred to as laryngologists, or otolaryngologists.

Treatments. Treatment of vocal pathology of the voice varies based on the diagnoses. General recommendations include getting healthy amounts of sleep, maintaining systematic hydration (Alves *et al*., 2019; Bhavsar, 2009; LaPine, 2008; LeBorgne, 2014; Thurman, 1983)

which can include steam therapy treatments (Alves *et al*., 2019). Often singers are prescribed antacids for heartburn and GERD/LPR as prescribed by a doctor. Vocal rest and the limiting of voice use to a certain extent is sometimes recommended (LeBorgne, 2014; Thurman, 1983). Though true voice rest is not feasible due to the nature of the cognitive process and neurological response of the brain to auditory stimulus, doctors will recommend rest with an equal amount of time after using your voice extensively (Thurman, 1983). They recommend that if one is needing to sing or speak with high-intensity (such as singing using strenuous vocal techniques), to then shorten the doses in order to limit the impact stress on the vocal folds (LeBorgne, 2018). ENTs, or otolaryngologists, will often refer singers to a Speech-Language Pathologist (SLP) for voice therapy for the speaking voice, or to a singing specialist for the singing voice. There are certain medications prescribed, such as a steroid in order to allow the voice to heal faster, but this treatment is very controversial. In very serious cases surgery may be suggested, but in most cases all other courses of action are followed prior to surgery.

Stigma in the singing population. It is often considered taboo to talk about vocal injury in the performance world, as it is often viewed as a result of poor training, habits, or faulty technique (Achey *et al*., 2016; Cupido, 2016; LeBorgne, 2019). Renowned otolaryngologist Robert Sataloff (1997) stated in one of his many treatises that announcing a vocal pathology diagnosis to a singer can be compared to announcing a life-threatening illness. Fear of diagnosis, anxiety regarding the physical examination, or uneasiness in seeking out a voice specialist may prevent singers from seeking out treatment for issues with the voice (Gilman *et al*., 2009). Singers are known to frequently base their self-worth on the opinions of others, particularly women who believe that vocal quality issues are a direct result of not taking care of their health, poor vocal training, or singing using incorrect technique (Sandgren, 2002). Classically trained

singers, especially those with more vocal training, demonstrate greater anxiety regarding vocal pathologies, or voice issues, going to an otolaryngologist or speech pathologist, and scope examinations (Kwak *et al*., 2014).

There may be a lack of education amongst vocalists regarding voice care that may be contributing to these fears. Vocal pedagogy and hygiene are specialized studies in higher education settings, but the behaviors and understandings of the voice are a direct product of the music education system. Whether music studies be provided formally or informally, in school or in the home, in private lessons or at a place of worship, the education of the voice and its function begin with education.

Vocal Music Education

Kenya. The Republic of Kenya lies on the east coast of Africa, at the level of the equator. The British ruled Kenya from 1895 to 1963, and it was named a royal colony in 1920 (Porter, 2000). Kenya became an independent nation once more in 1963. There are over 40 tribes or ethnic groups in Kenya, including the Kikuyo which makes up 22% of the population and the Luo, another 15% (Porter, 2000). Another prevalent community are the Maasai. Kenya's national language is Kiswahili (or Swahili) and its official language is English, though many other languages are spoken throughout the country (Floyd, 2001; Porter, 2000). Kenyan views of musicians vary: while they are appreciative of their services, musicians are not treated seriously (Kavyu, 1975). Musicians are considered failures by some because they were unable to live a routine, normal life (Omandi, 1980).

Curriculum and practice. When Kenya achieved its independence from Britain in 1963, the music of Kenya had a resurgence, and with it music education took prominence, largely because of the fact that then President Mzee Jomo Kenyatta loved music and dance (Mindoti &

Agak, 2004). Kenya's Constitution (2010) actually protects and promotes music making as a form of cultural expression, and provides constitutional rights regarding music policy. In Kenya. music is used to develop human interaction skills, promote positive social behaviors, create employment opportunities, and enhance the identity of the country (Republic of Kenya, 2015). Schools are public, private, or Harambee schools in Kenya, which are partially funded by the government and less selective than public schools (Clark, 2015). 80% of the population goes to three years of primary school as school is not compulsory in Kenya (Porter, 2000). Education was not free for primary school until 2003, and then for secondary school only in 2008. This greatly increased school enrollment even at the university level, which doubled between 2012 and 2014 (Clark, 2015). Despite these increases, 10% of younger people in Kenya have not completed primary school, and the older generations have an even significantly lower number (Clark, 2015).

In the mid-19th century, missionaries established a Western hymnal singing tradition taught by rote, which marked the beginning of formal schooling. In this system, the learning or performing of traditional indigenous music was discouraged because of its non-Christian content (Weman,1960). Singing was introduced to school as a subject in Kenya in 1921, and the curriculum was entirely Western in nature (Floyd, 2003b). Graham Hyslop, a British composer and educator founded the Department of Music of what is now Kenyatta University (then college), and played a large role in integrating Western music education pedagogies and methodologies with the traditional music of the people of Kenya (Hyslop, 1964). His influence is still present today, as the study of vocal pedagogy by Elizabeth Andang'o suggests (2000). British colonial musicianship qualities greatly impacted music education through Kenya in the early 20th century.

After attaining independence from Britain, the government in Kenya intentionally sought to balance the Western musical influence and the indigenous music of the Kenyan people (Akuno, 2007). Music education in Kenya has been steeped in Western traditions with both curriculum content and musical literacy pedagogies for many years, which feeds the Eurocentric music education system that is disenfranchising Kenya' cultural and musical heritage (Akuno, 1997; Nzewi, 1999). Current educational reform in Kenya is based on Kenya Vision 2030 (Republic of Kenya, 2007), a national reform that encompasses all of the Kenyan government and its system (Republic of Kenya, 2007). It is the blueprint for Kenya's education development plan up to the year 2030, and incorporates music education as to further develop economic prosperity and global competitiveness, as well as national unity and citizenship ideals (Republic of Kenya, 2015).

To do this, indigenous music is being emphasized. While music education varies in Kenyan schools, music in education and the community are very prevalent as the indigenous music of each cultural community with traditional songs and dances are a part of regular life, is how children are socialized, helps form their individual, family, community, and national identity, and educates the members of the community informal (Akuno, 2007). There are no conservatory-like settings in Kenya where musicians can exclusively study music, though there are private music schools (Republic of Kenya, 2015). In order to receive certification in music, students can only receive standardized testing with either the Associate Board of the Royal School of Music (ABRSM) or other similarly Westernized certification programs based in London (Wambugu, 2012). Universities in Kenya until very recently did not include any coursework on Kenyan music, but mainly focused on Western traditions (Wambugu, 2012).

Vocal music education. Vocal music education in Kenya is a bit of a misnomer, as one cannot separate singing and dance in most African music (Barrett, 2019; Gibson, 2019), particularly Kenyan music (Senoga-Zake, 1986). Music-making in a group setting in traditional African society involves song, dance, and instruments, usually simultaneously, blurring the line between performer and audience (Akuno, 1997). The "audience" is often part of the ensemble. Each experience unique and new because of the constant interaction and improvisation between performers and "audience" (Omondi, 1980). In the truest sense of indigenous music in Kenya, there is no audience, as all participate in the experience. This is very different from the separation between performer and audience members in Western tradition, principles that are also imbedded in Kenya's musical culture in other settings. Globalization has altered the nature of music and dance in Africa in an adverse way (Wanyama, 2012). Because there is no separation of music and dance within Kenyan indigenous culture, when one is affected they both are. In Africa, ritualistic music has a very specific social function. If performed outside of that function, part of the meaning is lost (Powers, 1980; Fung, 1995). Music in Kenya is not considered entertainment, but rather an important way of expressing the hallmarks and daily existence of life. Indigenous dance and ceremony have been altered because of the changes implemented in religion, culture, and education with the influence of European colonialism and the tourism industry.

Music education in Kenya is currently considered bi-cultural, where both Kenyan and Western music principles are taught (Omolo-Ongati, 2010). As a result, traditional Kenyan music and dance have been infused with influence from these other cultures, and there is a fear that the traditional purpose and art are being lost (Wanyama, 2012). Though the traditions of Kenya are important to the teachers and government to include in the curriculum, the singing and

dancing traditional songs has been overlooked in the past in favor of teaching Western principles such as musical literacy, genres, and other pedagogical practices (Kilonzi, 1998). Every child enrolled in primary school in Kenya takes music as part of a creative fine art aspect of curriculum, and may take it as an elective in secondary school (Akuno, 2012). The music syllabus under the 8-4-4 system includes teaching music that promotes nationalism such as the National Anthem, varied folk music in its proper context, with costumes, dance, and instruments (Floyd, 2003a). An important resource that is often used as a classroom resource at all levels of education is the book published in 1986, *Folk Music of Kenya* by George Senoga-Zake. It provides an overview of the varying folk musics and their intricacies, and provides cultural and historical context for the songs (Wambugu, 2012).

There are few resources for music educators beyond this textbook. Some schools have instruments for students to play, but teachers are sometimes not trained in these instruments, so they sit unused and singing activities are performed instead (Akuno, 2012; Mwangi, 2000). Music is a required component for teacher training in all subjects at the Teacher Training Colleges (TTC) (Akuno, 2012). The compulsory music courses taught in teacher training colleges are often seen as unimportant (Wanyama, 2005). Music educators are often ill-trained, and many are part-time or simultaneously required to teach other subjects (Andang'o, 2000; Republic of Kenya, 2015). Music educator pre-service training incorporates the traditional music of Kenya, but according to a study by A.W. Wamunyu (1999), they feel less prepared and would like more training. That study also found that music teachers felt that both Western and traditional music from Africa should be taught, as both held great value for the students' education (Wamunyu, 1999).

Choral pedagogy. Vocal music in Kenya is based on a five-note pentatonic scale, and its rhythms are polyrhythmic in nature, with many instruments and timbres. The oral tradition of music not only involves imitation and repetition, but also encourages improvisation, using spontaneous sounds and audience participation to produce a joyful, boisterous, and interactive experience (Adedeji, 2005). Both imitation and performance are encouraged as pedagogical techniques in order to develop creativity and comfortability in performing traditional music (Ongati-Omolla, 2010). Current practices also incorporate basic Western musical notation being taught at the primary level, such as clefs, note names, and rhythmic values of notes, along with singing activities (Akrofi, 2002). Curwen's Sol-fa system is used in many music education classrooms for singing instruction throughout Kenya, likely as a result of the influence of the missionaries who brought this system from the United Kingdom (Akrofi, 2002). While most in Kenya do not read music, and learn music through oral and aural tradition, an abbreviated system is widely used using part of the Sol-fa system and other symbols that represent rhythmic values (Hopton-Jones, 1995).

There has been a call for decades for traditional music from the diverse Kenyan cultural communities to be formally taught in schools with an equal or greater weight, rather than a purely Eurocentric approach to western classical music dominance (Kavyu, 1975). However, music outside of cities and in small villages is still very specific to that tribe, and has its own set of traditions and practices (Floyd, 2001). There are songs for occasions such as religious festivals, courtship, marriage, war, death, funerals, births, circumcisions, field songs, canoeing songs, praise songs, songs for animals, songs for nature such as rain songs, seasonal songs, food preparation songs, coming of age songs, and many other examples, most of which incorporate dance or movement (Porter, 2000). Music education in Africa does not only occur in the

classrooms, but has been an informal part of the daily culture without the motive or necessity of creating master musicians (Nzewi, 1999). As a result, singing is socially very acceptable. Singing begins when a child is able to talk, and is done daily, and regardless of ability (Porter, 2000; Simako, 2009). Singing is the primary form of music education in schools, and is included in all levels of general instruction (Akrofi, 2002; Mindoti & Agak, 2004). Singing is almost taken for granted, as it is an expected skill in Kenya.

Music education in primary school is not taught for the purpose of singing for its own sake, but rather to memorize facts and learn skills (Akuno, 2015). Children's songs sung in Kenya often reflect the societal beliefs and longings of that culture (Senoga-Zake, 1986). Often the indigenous music of Kenya is about the reality of daily life, including the hardships of political and social strife (Akuno, 2015). Most secondary schools have an extra-curricular singing ensemble, either led by the classroom music teacher or choir director if music is offered at that school, or a hired choir trainer if not. In a survey of Form 4 (equivalent to the last year of high school) classroom music teachers or choir trainers in Kenya, it was found that the curriculum was mainly guided by performance aspects of the African art music being taught, followed by historical and cultural elements of the music, analysis of the music, composer biographical information, or all of the above. Other responses included exporting the rich traditions of the cultural music of Kenya, critical thinking, and the development of African art music and effect of Western classical music. The majority felt that teaching Kenyan choral art music was very important, with 79% of them teaching these genres because of the cultural, musical, and academic benefit of the genre (Wambugu, 2012). Choirs mainly exist to compete in the Kenya Music Festival and for entertainment purposes (Wambugu, 2012).

Kenyan choral music is a prominent art form, largely because of the national development activities and festivals such as the National Music Festival. The performance of Kenyan choral art music is very well established in Kenya, particularly in preparation for the Kenya Music Festival, as taught in extra-curricular settings. It is not formally part of the national music curriculum, and at times that limits the resources available to schools that wish to teach this genre, and its addition would help students to transfer concepts from Western classical music and provide a more comprehensive education (Wambugu, 2012). Festivals range from local or inter-house festivals between schools to the large Kenya National Music Festivals which incorporates many genres, including Western European genres as well as traditional folk songs and dances, new Kenyan compositions, and arrangements on traditional musics of Africa (Akuno, 2007; Wambugu, 2012). Many musical genres are represented in the festival, including traditional folk songs, compositions and original works, Asian music, and Western classical musical styles (Wanyama, 2005). Schools ranging from early education to university participate in the annual Kenya Music Festival, a co-curricular competition hosted by the Ministry of Education, where there is no required training or expectation of ability or experience of the teachers or choir directors (Akuno, 2012). The main purpose of the Kenya Music Festival, attended by students throughout the nation annually are to encourage the study, practice, and development of music and dance, to provide an opportunity for those with talent to perform, to promote and train in Kenya's own musical cultural heritage, and to encourage national unity (Wanyama, 2005).

In a summary of National Music Festival Adjudicator guidelines, the following items are assessed for choral set pieces (E. Obanda Mbinji, personal communication, June 25, 2018):

1. Awareness of the context (composer, period, style awareness)

2. Following music expression markings provided in the music
3. Accuracy of pitches, rhythms, and phrasing
4. Diction (defined as correct articulation of consonants and vowels placement in accordance with the language characteristics of the song)
5. Appropriate tempo
6. Interpretation of the style of music
7. Intonation
8. Blend-defined as to exist together as a combination of the individual voice parts and whole ensemble, to mix voices thoroughly to give good results and to produce harmonious effects
9. Balance-defined as the ensemble is singing together
10. Voice range (to make sure that any of the particular voice doesn't suffer) (in the categories of pop tunes and melodies (*Zilizopendwa*), African Gospel Music, and the rest of African music (from the year 2000 & earlier)
11. Authenticity in terms of mode of tone quality (African Folk Songs)
12. Sing normal and use a natural pitch/tone to avoid straining (*Taarab* Music)

These guidelines, while informal and specific to the adjudicator who shared their notes with the researcher, are very similar to those found in Western choral pedagogical practices, likely due to the fact that music certification in Kenya is rooted in British tradition. Notably, breath, vocal tone, nor freedom from tension are not mentioned as characteristics to comment on by this adjudicator.

Vocal health and technique. Music and singing are a part of the socialization of children in Kenya, and are a regular part of children's lives, though this tradition is not used to the

learner's benefit (Akuno, 2015). Teachers do not always recognize that young children can be taught to sing purposefully from a young age (Akuno, 2015). While singing is done confidently in the classroom, it is simply done so for the convenience of teaching something comfortable to the students because of lack of resources of instruments or printed materials. Music, and all of the creative arts, are taught using a very theoretical approach to the learning process (Gregory, 2012). Song is used regularly in primary classrooms by general teachers in order to teach educational and social concepts to students by changing the words to familiar tunes, but little to no attention is given to the sound or technique used (Akuno, 2015). Because singing is a coordinated skill that involves ideal bodily collaboration that is not innate, this likely reinforces unhealthy singing techniques.

Depending on the teacher or facilitator, beautiful singing is at times observed and modeled by students as it relates to pitch, diction, and sound quality, though these skills are passed without direction instruction (Akuno, 2015). This could be attributed to the melodic sound of the native languages in Kenya. Like many languages and dialects from the African continent, Kiswahili is a tonal language (Yang *et al*., 2015). The native dialects for the more than forty cultural communities in Kenya are also tonal which may lend young singers to be more musical in nature. Students don't just learn songs from their teachers, they learn how to sing the songs in an efficient manner with this rote learning and immediate imitative process that is ingrained in their learning pedagogy (Akuno, 2015). In Kenya, children sing freely and without the hinderance of social concerns or at the request of their teachers; it is natural to their culture and they often create songs and chants while playing, and interacting with each other in music-making and dance (Akuno, 2015).

As children grow into adolescence, the availability for vocal music instruction diminishes. Few teachers have advanced musical training. Candidates for music education are even said by some to be unable to demonstrate musical behaviors as performers, listeners, or composers (Akuno, 1997). The curriculum, poor methodologies, lack of available resources, and poor teaching by music teachers due to their lack of training and educational handicap have an impact on music education in Kenya (Mochere, 2017). Music is either taught using rote and imitative pedagogical approach with an appreciation of the creativity that stems from that method, or through performance practice, where the students learn by doing (Omollo-Ongati, 2010). Adedeji (2005) characterized African music as being learned orally with repetition, with an emphasis on improvisational, boisterous spontaneity, extemporization using an unlimited array of sounds; creation and recreation, and using percussiveness, a sense of sacredness, integration of all art forms, and incorporating audience participation.

Singing can be used as a pathway to success in other domains, such as developing and enhancing the vocal skills for the speaking voice (Akuno, 2015). Vocal technique and tonal quality changes based on the style and sounds needed for the style and song. Sometimes singing is speech-like or chant using different registers or timbres, other times imitative of nature, animals, or percussive sounds; at times the tone is nasal, sometimes high-pitched almost-yelling; sometimes soft, low-intensity sounds are called for, and sometimes a high-pitched ululation is prominent, which is a jubilant uvular trill (Yang *et al*., 2015).

In a study of secondary music students in Nairobi County (Mochere, 2017), it was determined that the most frequent instructional strategies used in music classes were discussion (91%), giving explanations on composers, works, and historical periods (87%), describing intervals, triads, and vocal techniques (74%), sight-singing/playing (57%), listening to Western

music (44%), playing melodies, intervals, and triads (44%), voice training (44%), writing melodies (39%), clapping and tapping rhythms (39%), singing scales (30%), and describing cadences (22%). Students stated that they rarely or never listened and imitated melodies (61%), composed melodies (100%), visited music centers (83%), received voice training (26%), danced (100%), or listened to a variety of African music (100%). Mochere (2017) stated strongly that the students in Nairobi County "cannot sing, read music, or play an instrument and have not developed a lasting interest in or appreciation for music" (p. 10).

Proposed curriculum was introduced in the Mochere study that espoused incorporating a pedagogical approach that is based on the indigenous African model (Nzewi, 2001), to offer cross-collaboration for students to learn from each other on cultural days and facilitate workshops to learn performance practices of indigenous music first-hand (Omollo-Ongati, 2010). Additionally, Mochere suggested that Western education pedagogical approaches such as those suggested in 1959 by Leonhard and House (teaching of performance skills, music reading, appreciation, and attitudes); by Charles Hoffer in 1983 (experiential learning in part and whole that incorporates aural learning, focuses on the strengths of the learner, allows for mastery, and teaching with a view of how the students can benefit the market/industry); by David Elliott in 1995 (principles of modeling, coaching, scaffolding, fading, reflection, and exploration); by Joyce and Weil in 1996 (behavioral learning for mastery using direct instruction, incorporates informal, peer-led learning, and teachers act as facilitators); and by Campbell and Scott-Kassner in 2010 (starting and ending the class in a distinctive and consistent manner, providing feedback, and using repetition and rehearsal to stimulate aural learning). These suggestions would partner well with those made by Elizabeth Andang'o (2000) in terms of consistency and scaffolding for vocal pedagogy and technique.

United States. Formal Music education in the United States was introduced to public schools in Boston by Lowell Mason in 1838, its purpose was to provide not only musical, but also a moral, physical, and intellectual foundation (Mark, 1996). The United States was a fairly young country at that point, having declared its independence in 1776. Music education flourished for many years, with formal music learning being very Eurocentric in nature, and based on Western classical tradition until the early 20th century when other influential music was introduced to the public. Music education is offered at 94% of all elementary schools in the United States, however those numbers decline as students move into secondary schools (National Center for Education Statistics, 2012). Primary education in the United States includes vocal music, and many elementary schools also offer a chorus.

Curriculum and practice. American folk music plays a large part in K-12 school curriculum, and is often the foundation of music making, particularly for elementary level music education. Multiculturalism has also played a large role in American music education curriculum, largely due to the pluralistic nature of such a blended society (Campbell, 2018). Many textbooks that have been adopted into schools in the United States include American folk music in order to inform the next generation and raise cultural and historical awareness of their heritage (Lomax & Lomax, 1941; Xiques, 2014). In the 1960's, pre-service music education curriculum began to be altered with the inclusion of global music education as part of many universities' curricula (Campbell, 2003). Music Education workshops and clinical activity within professional organizations in the United States saw a great increase in multiculturalism in the 1980's and 1990's (Anderson & Campbell, 2010), indicating that there is a need to continue to develop and train teachers in this area.

In many schools across the United States, curriculum is guided by national and statewide initiatives and guidelines. The National Standards for Music Education were developed by the National Association for Music Education (NAfME, 2014). They include standards involving multicultural music education. The U.S. Department of Education is the federal organization that mandates nationwide education initiatives, but unlike Kenya, the federal government does not mandate curriculum or standards, and there is some autonomy under the oversight of state Department of Education organizations and suggestion of national and statewide standards by music education professional associations. This as creates a wide discrepancy in educational practices in music classrooms between school districts around the country. Additional standards are developed by the music education organization for each state, and are often based on the national standards. The national standards were influenced by foundational symposiums and documents, or "white papers" such as the Tanglewood Symposium in 1967, and the *Vision 2020* Housewright Declaration in 1999, both of which advocate for diversity of repertoire, style, and culture in music education. There was and still is discrepancy and inequity in putting these standards and ideals into practice in the United States (Kalogeridis, 2020).

The Core Music Standards address the development of skills, knowledge, and dispositions desired by music teachers for their students to engage in music education while achieving literacy in music (NAfME, 2014). Music literacy is often considered a marker for a quality choral program. Knowledge refers to the musical structure and elements; historical and cultural content and context; evaluation criteria is used to define how we evaluate musical performances through a set of criteria. Skills refers to performance skill and ability when singing or playing an instrument; creating refers to imagination and the ability to create or refine music; listening, reading, and notation literacy skills; and evaluating as it relates to these skills at both

the individual and group level. Dispositions refers to a list of qualities of both character and mind that the National Association of Music Education (2014) has determined that music incorporates or elevates including collaboration, flexibility, goal-setting, creativity, inquisitiveness, openness and respect for ideas and the work of others, responsible risk-taking, self-reflection, self-discipline, and perseverance. In the 2014 Core Music Standards, Common Anchor #6 for ensemble artistic process of performing states: "Demonstrate attention to technical accuracy and expressive qualities in prepared and improvised performances of a varied repertoire of music representing *diverse cultures and styles*" (MU:Pr6.1.E.8a). It was under this standard that music educators felt empowered to introduce world music, and some even introduced CCM genres in order to garner the interest of their students.

The addition of popular music to music education curriculum to bring the "music of the people," or vernacular music, is one that is becoming more prevalent in the conversation of music educators. This is not a new concept, with one notable example already mentioned being the Tanglewood Symposium in 1967, where leading figures in music education as well as scientists, labor leaders, educators, representatives of corporations, sociologists, musicians, and others joined to collaborate and brainstorm regarding the future direction of music education. More than 30 years later this initiative was still being promoted by leading music educators when they gathered and penned the Housewright Declaration, and *Vision 2020* continued this trend. The Housewright Declaration specifically called for the music educator to, "expand as settings for music instruction proliferate. Professional music educators must . . . coordinat(e) music activities beyond the school setting to insure formal and informal curricular integration" (p.143).

In 2015, the Every Student Succeeds Act (ESSA) was passed by legislation, and was implemented in August 2016. The most significant change for music educators is the emphasis

placed on a "well-rounded education," the phrase which is consistently placed throughout the document. This language replaces the phrase "core academic subjects" in favor of a more broad, well-rounded, comprehensive education that includes the arts. According to the 2012 U.S. National Endowment for the Arts Survey of Public Participation in the Arts, those who performed in high school are 258% more likely to sing as adults. Chorus America reports in their 2016 Chorus Operations Survey Report that an estimated 32.5 million adults, or 18.1% of households in America report that one or more adults currently participate in a chorus of some kind (professional, symphonic, volunteer, or children's/youth choir). This does not include children, which raises that number to 42.6 million. They reported that there are almost 270,000 choruses, including at least 41,000 K-12 schools, 216,000 religious choirs, and 12,000 or more professional and community choruses (Chorus America, 2016). These choirs are mostly made up of volunteer community and religious choruses. Choral music is thriving in the United States. Analysis of national data indicates that lifelong musical participation is more likely as a result of school-based ensemble participation (Elpus, 2017). School setting provide the fundamentals for many lifelong musicians.

Vocal music education. Music teacher training in the United States very diverse, as there is not a national standard beyond the optional accreditation standards for tertiary institutions. Some music educators receive a performance degree but take no education classes, while other programs are more collaborative with the College or School of Education. Because many state certifications allow for educators to teach a subject if they merely pass a certification test, others require a master's degree in order to teach music. There is a wide discrepancy between music educators as to their knowledge base, training, and experience in vocal and choral pedagogy. Generally, those who major in music with voice as their primary instrument have had three to

four years of private voice lessons. Many accredited universities require voice students to take vocal pedagogy as a course. That being said, studies have shown that rural music teachers were not considered to have as high a mastery level or specialty as in more urban settings, and are required to teach other subjects or work at multiple job sites, spreading them even more thin and with less resources than teachers in suburban and urban settings (Burrack, 2009; Isbell, 2005). Many music educators may feel ill-equipped to teach multicultural music due to lack of training on authentic performance practices (Butlera *et al*., 2007; Norman, 1994; Young, 1996). There is not enough training regarding vocal pedagogy or vocal hygiene in typical training for music education (Schwartz, 2012). In one study, one-third of those surveyed received no vocal health training of any kind in their pre-service music education program (Askren, 2001).

Choral pedagogy. The second half of the 20th century saw not only an increase in diversity in musical styles and genres, but also diversity in teaching methods. Two prominent methods that arose were the Orff and Kodály approaches to music education. Carl Orff's method incorporates music skills that combine speech, movement, and dance (Mark & Gary, 2007). Orff-Schulwerk pedagogy is often used in primary school education throughout the United States, and combines musical play and improvisation, allowing for creative freedom in musical activities, allowing for a stimulation of the other musical activities (Klopper, 2010). Another popular method was Zoltan Kodály's method, which applied John Curwen's hand signs and the tonic Sol-fa system. Both are heavily utilized in choral classrooms in the United States and world-wide (Mark & Gary, 2007). Traditional ensembles play a large role in the musical practices in secondary American music classrooms, whether they be instrumental or choral in nature. Other ensembles such as multicultural and popular music ensembles are often found in schools around the nation. Music educators that focus on literacy often use either movable-Do or

fixed-Do systems, Do- or la-based minor, and either countsinging or Takadime are popular for rhythmic literacy and precision.

In 2012 a consortium of university-level choral directors and music educators (Napoles, Babb, Reames, Garrett, & Bowers) wrote an article entitled, "On the Voice: Beautiful Singing with Developmental Choirs". These directors represented top universities in the United States, and covered vast regions of the country including Texas, Oregon, New York, Ohio, and Florida. They each contributed to one publication which detailed how educators in the United States can and should strive to teach developmental, particularly middle school and young high school choirs. This article summarizes what and how choral music educators focus on in order to facilitate beautiful singing in their ensembles. One component named is pitch-matching and re-voicing music, particularly for changing voices. Another aspect is building tone using a sound pedagogical approach which includes warm-ups that allow for transfer to the literature, alignment, breathing exercises, easy phonation exercises such as lip trills, phonation that teaches vowel and consonant placement, resonation, articulation, ear training, use of anatomy and physiology, vocal health, and vocal hygiene, proper use of the speaking voice, and understanding students' range and tessitura as it relates to literature selection. A third aspect is literature selection that provides a quality musical experience for students, and using teaching strategies in order to develop literacy and tone-building skills. This leads to skill-building such as sightreading exercises and creative warm-ups, both of which are used in an effective spiral curriculum to reinforce the foundations of singing being developed coupled with the literature and pedagogical tools for transfer such as informal teaching and flipped-classroom. This is done to foster the students critical-thinking skills and provide tools for them to become independent, life-long musicians. In order to provide this type of education, the fourth aspect of the article on

beautiful singing reinforces pedagogical approaches to help with teaching for transfer in mind, allowing the students to become confident, expressive singers.

In order to develop habits for healthy choral singing, Thurman (1983) advised to teach vocal hygiene, voice conservation and care strategies; listen to each choir member's speaking voice every two weeks to ensure that they are not hoarse (and don't let them sing if they are); establish a vocal health policy that includes hydration; always warm-up the choir prior to singing; sing softer when learning parts to reduce hyper- tensional use of the voice; avoid repetition of sections of the music that are extremely high, low, loud, or soft; encourage choir members to only sing as loudly as they can beautifully; teach the singers to internalize the feeling of healthy singing rather than the sound; teach students about excessive voice use such as singing in multiple ensembles, in a musical, on chorus tours, and singing in honor choirs; and finally, take care not to impose excessive stressors on our students in order to reduce psychological stress. As he said, "We are working with human beings, not singing machines which have been made available for our greater glory." (p. 27)

While there is no national standard of what is expected for choral pedagogy, each state has its own set of standards for what is evaluated at both adjudicated events for choirs as well as admission into an all-state chorus. An overview of what is expected by the National Music Adjudication Coalition (NAfME, 2019) combined with some representative states in the United States where music education thrives including Texas (UIL, 2019), Virginia (VCDA, 2019), and Florida (FVA, 2019) include:

1. **Vocal Quality/Tone/Sound Quality** (healthy tone, natural for the age group, resonance, focus, free from tension, vibrant, placement, breath management/support that supports the tone, pure vowels, unified vowel formation, clear/concise

consonants, beauty and freedom, register adjustment, control, blend, dynamic contrast without distortion, intonation between and within sections)

2. **Technical Preparation/Accuracy/Technique** (Pitch and rhythm accuracy, intonation, vocal flexibility and articulation, entrances/attacks, releases, diction, pronunciation, clarity, balance between and within sections)
3. **Musical Effect/Musicianship/Interpretation** (Posture, appropriateness of style, tempo, sensitivity to phrasing, dynamic contrast, use of full range of dynamics as well as subtle changes, observance of musical markings, articulation markings, musical interpretation, expression, dramatic effect, artistry, nuances, communicating with a sense of purpose)

Vocal health and technique. There are various arguments for and against the alteration of vocal music curriculum, but one that is most prevalent is in the area of choral music education is regarding the concern of the vocal health of students. In one of the few textbooks geared at choral pedagogy, Smith and Sataloff (2013) stressed the need for choral directors to have a thorough knowledge of vocal pedagogy. Research indicates that teachers are not well-trained in the area of developing healthy speaking behaviors or preventative techniques prior to entering the classroom (Beeman, 2017).

Dysphonia in the Speaking and Singing voice

People who sing more often tend to have a higher percentage of self-perceived dysphonia, particularly those who are traditional and popular music singers, as well as music teachers because of their overuse of the voice in speaking as well as singing (Pestana *et al*., 2017). Singers are seemingly more in-tune with their vocal mechanism (Cohen *et al*., 2008), and

seem to be the most sensitive to disorders of the voice, seeking medical attention more often as a result (Cohen *et al*., 2007; Howard, 2009; Murry *et al*., 2009).

In a study of higher education voice teachers and their explicit instruction of healthy vocal technique of the singing and speaking voice, results indicated that even if there is not explicit connection between the two, voice teachers demonstrate implicit knowledge of the connection between the two, and monitor their students' speaking and singing voice (Beeman, 2017). The training of the proper use of the speaking voice could cure most disorders of the voice that stem from phonotrauma and misuse of the voice (Sataloff, 2017a; Sataloff, 2017b) The same structures that are used in the singing voice are used in the speaking voice. The speaking voice has an impact on the speaking voice in a myriad of ways, primarily with phonotrauma of yelling, screaming, loud talking, harsh sneezing, loud talking, overuse, and harsh laughing (LeBorgne, 2019). In a study of CCM "gig" performers who have high vocal loading from using their speaking voice during their daytime jobs, it was found that there was a direct negative impact on their singing voices for evening performances (Bartlett & Wilson, 2017).

When speaking voice concerns were raised, common exercises for vocal rehabilitation focused on posture, breath, and principles of resonance in singing that could be transferred to speaking; in addition to semi-occluded vocal exercises such as humming, lip trills, tongue trills or raspberries, sirens, sighs, and exercises focused on vowel alignment and easier onsets (Beeman, 2017). Altering the pitch of the speaking outside of the natural range, whether it be lower than is natural as is commonly practiced in the United States, or higher than the natural pitch causes vocal fatigue and swelling which may lead to long-term phonotrauma (Smith-Vaughn *et al*., 2013).

Measuring Dysphonia. Measuring dysphonia has changed drastically in the last 30 years. In traditional assessment from the 1990s, patients were evaluated using "objective voice measurements" which measures a small element of vocal production (shimmer, jitter, airflow, and other acoustical properties) (Rosen *et al*., 2004). This later progressed to a combination of magnified images and video with laryngeal examination (Behlau *et al*., 2016). Diagnostic tools such as laryngeal videostroboscopy, laryngeal electromyography (EMG), electroglottography (EGG), and subglottal pressure measurements have also been used as primary clinical diagnostic tool for evaluation of dysphonia. Evaluation methods have also expanded to include self-rating questionnaires that assess the patient's perception, feelings, and quality of life as they relate to the voice (Desjardins, 2017). There are three ways to measure vocal health, or the absence of dysphonia: Cognitive assessment of brain activity and cognitive function of healthy singing using dynamic MRI technology (Kryshtopava et al., 2017), laryngeal evaluation for vocal pathology, (Castelblanco *et al*., 2014), acoustical measurement, and psychosocial self-rating measures.

Self-rating assessment tools have long been used in clinical settings as a valuable resource for medical practitioners and Speech and Language Pathologists (SLPs) (Bassich & Ludlow, 1986; Hogikyan & Sethuraman, 1999; Lee *et al*., 2005). They are often used in conjunction with other assessments in order for medical practitioners to have a clear understanding of a patient's self-perceived vocal issues (Lee *et al*., 2005). Patient self-perception of their voice quality is considered highly relevant in the medical field (Lee *et al*., 2005), which is why a prevalent tool used in speech and language communications therapy is the Vocal Handicap Index (VHI). Developed to allow patients to assess the impact of dysphonia on the quality of life (Jacobson *et al*, 1997), this measure is the most commonly used psychosocial

measurement for self-assessing the severity of vocal disorders (Behlau *et al*., 2016; Rosen & Murry, 2000).

Development of the Singing Voice Handicap Index (SVHI). In order to fill the void for singers, Cohen and others (2007) created and validated the SVHI using an experimental study with a control group. This 36-item self-reporting psychosocial instrument measures dysphonia in singers and encompasses any disorder of the voice. It is a widely used instrument for voice and speech pathologists, otolaryngologists, and vocal pedagogues, and it is shown to have both reliability and validity when measuring dysphonia in singers (Behlau *et al*., 2016; Castelblanco *et al*., 2014; Cohen *et al*., 2007; Cohen *et al*., 2008). Each of the 36 items evaluates either the physical, emotional, social, or economic impact of vocal issues, and is based on a 5-point Likert scale, with 0 standing for "never" and 4 representing "always). Raw scores range from 0 (a perceived complete absence of dysphonia) to 144 (a perceived high level of handicap due to dysphonia). The raw score is then scaled by multiplying the total by 100, and dividing by 144 to produce a total SVHI score. A cut-off score has not been defined, but in their original study, Cohen and his colleagues (2007) determined that singers without vocal complaint had a median total score of 22, while those with singing voice complaints had a median of 61, providing some reference for understanding the scores in context.

The SVHI has been shown to effectively measure responsiveness to treatment of vocal disorders (Cohen *et al*., 2009), and can be used to facilitate a comprehensive understanding of a person's vocal health in conjunction with physical examination of the larynx, and to help determine treatment options for those who suffer from any form of dysphonia. It has also been assessed and correlated to both acoustical measures (Niebudek-Bogusz *et al*., 2010) as well as to

pathology observed in a physical laryngeal evaluation using laryngeal videostroboscopy (Castelblanco *et al*., 2014).

Assessing Dysphonia Globally. An implication of the value of vocal health measurement tools is its use in measuring dysphonia in singers of traditional music from other cultures, a field that has little documented research. Outside of the realm of Western classical and popular music, many world cultures incorporate music making into their daily lives and activities. The stylistic treatment of much of the music from non-Western cultures such as traditional music in Africa, Indonesian singing ensembles, and the wide variety of traditional music from countries such as Korea, China, and India are directly contrary to the teaching of healthy singing styles in "legit" singing according to Western tradition, yet there are little to no indicators that the singers from these cultures suffer from dysphonia any more or less predominantly than those in Western cultures. Rarely is it even acknowledged that vocal techniques and laryngeal function may be perceived differently in certain Asian, Indian, Arabic, and other cultures that may prefer a different aesthetic (Smith & Sataloff, 1999). Despite this, dysphonia is beginning to be addressed in other countries, with the SVHI being translated into at least eight languages.

A recent study implemented the SVHI-10 (Cohen *et al*., 2009) with a focus of drawing attention to the vocal health risks within the profession of singers among the Bhagavatam musicians in India. In that tradition, the lead singer intentionally achieves special effects by allowing their voice to quiver between notes, sing in a high-pitched and loud singing style, and sing with an intensity that can carry emotions such as love, hate, surprise, and other extreme emotions in even outdoor settings with no amplification. The Bhagavata must also alter their breathing pattern and tighten the muscles in their face and throat, particularly as they sing in the

upper portion of their vocal register. These actions, particularly over time and with repeated performances imply that these musicians may develop vocal disorders (Gunjawate *et al*., 2017). These traits are similar to the stylistic vocal techniques found in singers from China, Africa, and India (Yang *et al.*, 2015). More research needs to be explored in this area as it relates to choral music education as well as the prevalence of dysphonia by singers from these non-Western cultures.

Conclusions supporting a need for the study

In the realm of trained vocalists in the Western tradition, popular music has long been perceived to be very damaging to singers' vocal health (Goetze, 2000; LeBorgne & Rosenberg, 2014). However, members new to choral music may have a passion for music, and often have more experience with informal singing. They may be more versatile in musical genres associated with CCM such as popular, rock, gospel, or other vernacular genres, but often choral music conductors and educators steer students away from these genres, sometimes citing vocal health as their justification. Singers who began formal vocal training while in school but are not actively engaged in ensemble singing are likely to continue to sing informally along with music streamed on their device or on the radio, in the shower, in religious services, at sporting events, at karaoke bars, or in private settings where they are comfortable. In these scenarios, most people will sing the vernacular music, not the alto part of their favorite choral piece from high school. Many experienced and well-trained choral and professional singers also formally and informally sing genres within the CCM umbrella. Because of globalization and increasing access via technology, music from world cultures is gaining increasing popularity and has impacted society and the music enjoyed and sung around the world. In order to train and empower singers, choral

directors need to have a greater understanding of the vocal mechanism as it relates to singing in multiple genres and how stylistic approaches affect vocal function.

Western vocal pedagogues generally believe that singing in any other way than a European style will threaten students' singing technique and vocal health. Despite the fact that singers within diverse cultures have enjoyed singing in these styles for centuries, we operate on the assumption that singing in any way other than our own must be unhealthy or impossible" (p. 24) (Goetze, 2000). One study (Smith-Vaughn *et al*., 2013) used multiparametric measures to evaluate the effect of singing in different genres on 20 adolescent choral singers ranging from 11-17. They sang three genres common to the repertoire that they typically sing in choir (classical choral music, gospel, and musical theatre) while being recorded using laryngeal videostroboscopy. Additionally, the participants' voices were analyzed using an acoustic evaluation, and also completed a questionnaire that assessed their medical history and vocal behaviors. The study found that in that sample, gospel singing produced slightly more tension than classical choral within the vocal mechanism ($p < .01$), and musical theatre singing produced significantly more tension than classical choral singing ($p < .001$). It was found that these adolescent participants press while belting, as was indicated by the arytenoids and/or the ventricular folds (false vocal folds) being heavily engaged and covering the vocal folds unlike the more relaxed musculature found in classical choral singing.

As far as can been determined at time of this writing, no study was identified that analyze the effect of overall vocal health and vocal fatigue between choral singers in the United States and Kenya. Choral music education is widely promoted in Kenya, yet little research has been done regarding vocal health in general when singing the music within that culture. In the United States there is an abundance of treatises and research studies regarding vocal health and vocal

fatigue when singing in multiple genres, most notably within musical theatre, pop, and other CCM styles. This researcher was unable to attain any information comparing these genres. This study compared the definitions of vocal health in a cross-cultural way and will analyze the effect of singing in multiple genres, including subgenres of CCM and the traditional music of a non-Western country such as Kenya in order to discern whether vocal techniques or stylistic choices have any impact on the vocal health of choral singers from Kenya and the United States.

Chapter 3: Methodology

Research Design

Mixed-methods studies were primarily used to gain insight on overall human behavior by incorporating more than one method within a research design (Morse, 1991). In a Concurrent Transformative Design (Creswell, 2013), both quantitative and qualitative data were collected concurrently, with the design being guided by theoretical perspectives that are defined and led by the purpose of the study. The theoretical perspectives that shaped the quantitative portion of this study were based on the physiological aspects of the speaking and singing voice, vocal pedagogy and training, especially as they relate to genre, principles of vocal loading and fatigue, vocal hygiene, and the pathology that could occur in the voice. Qualitative elements of the study focused on understanding how vocal health was defined by participants, and how music educators from these two cultures address vocal health in both their pedagogical practices and repertoire selection. The study was conducted in a choral rehearsal setting, with one set of rehearsals in Kenya with the Nairobi Chamber Singers and the other in the United States with the Festival Singers of Florida.

Participants

This study was conducted with two auditioned, adult, semi-professional choral ensembles, both of which have a large percentage of music educators within their membership. Additionally, both ensembles sing a similar variety of repertoire including Western contemporary and traditional "classical" choral music, traditional folk music from around the world including that from various Kenyan cultures, as well as CCM genres. Both ensembles have

conductors trained in Western choral pedagogy, and both have an international reputation of excellence in the choral community.

At the time of the data being collected, the Nairobi Chamber Chorus (NCC) from Nairobi, Kenya had 30 members, 25 of whom completed the initial consent and questionnaires (n = 25). The Festival Singers of Florida had 98 members, 69 of whom completed the initial consent and questionnaires (n = 69). Of the 128 members of both combined ensembles, 94 participants (N = 94) consented to be a part of this study. An overview of the participants' demographic features is shown in Tables 3.1 and 3.2. Though there was disparity in the size of the groups, there were other similarities. All participants were adults between the ages of 18-56. The mean age of the NCC was 26.08 (SD = 5.72) and the mean age of the FSOF was 29.65 (SD = 7.22). The mean age of both groups was 28.70 (SD = 7.00, Sk = 1.46, Ku = 5.51).

Table 3.1

Participants (N = 94)

	NCC (n = 25)	FSOF (n = 69)
Sex	9M, 16F	27M, 43F
Age	*M=26.08* (SD = 5.72)	*M=29.65* (SD = 7.22)
	Range = 18-42	Range = 22-56
	Sk= 1.01	*Sk*=1.52
	Ku=3.82	*Ku*=5.36
Music Teacher	10 (40%)	61 (87.14%)
Chorus Director	6 (24%)	55 (78.57%)
Received Voice Lessons	6 (24%)	65 (92.86%)
Studied Singing in School	12 (48%)	60 (85.71%)

The sex of the participants was also very similar, with 36% males in NCC and 39% males in FSOF. There was disparity regarding race, as only 2.9% of the FSOF were Black, and 84% of NCC were Black. In both groups combined, 93% have attained at least a Bachelor's degree, with 34% having attained a Master's degree. Among NCC participants, 40% were music teachers, 6

of which (24%) taught choir. Among the FSOF participants, 87% were music teachers, with 61 (79%) teaching choir. The greatest difference between the two groups was in training; 93% of FSOF participants had received voice lessons in their training, and 86% studied singing in school, whereas 24% of the NCC participants received voice lessons, and only 48% studied singing in school.

Table 3.2

Demographic Data of Participants. NCC (n = 25), FSOF (n = 69), Total (N = 94)

	Choir		Frequency (n)	Percent (%)
Sex	NCC	Female	9	36
		Male	16	64
	FSOF	Female	27	39
		Male	42	61
Race	NCC	Black	21	84
		Prefer Not to Answer	4	16
	FSOF	Black	2	3
		Caucasian	65	94
		Prefer Not to Answer	2	3
Education	NCC	Secondary	5	20
		Bachelor	16	64
		Graduate	4	16
	FSOF	Secondary	2	3
		Bachelor	39	56
		Graduate	28	41

Instruments

Quantitative and qualitative instruments were used to collect data. Table 3.3 outlines the research questions and how they were addressed using the different instruments.

Quantitative Instruments. Prior to the study all participants responded positively to an online initial consent form, followed by a 39-question singer questionnaire using Qualtrics (Qualtrics, Provo, UT). Throughout the questionnaire two self-reporting instruments were included which measured the participants' overall vocal health of the singing and speaking voice.

The Singing Voice Handicap Index (SVHI) (Cohen *et al*., 2007) measured the overall vocal health of the singing voice, the Vocal Fatigue Index (VFI) (Nanjundeswaran *et al*., 2015) provided an overview of the speaking voice as it related to avoidance of use, physical discomfort, and the improvement of the voice with rest. Both were commonly used in clinical settings by speech-language pathologists as a part of a clinical evaluation of potential pathology

Table 3.3

Mixed Methods Research Design

Research Questions	Quantitative	Qualitative
1. How do semi-professional choral singers from the United States and Kenya define healthy singing?		Singer Questionnaire (Open-ended question)
2. What is the overall vocal health of members of the Nairobi Chamber Singers in Kenya and the Festival Singers of Florida in the United States? What is the relationship between overall vocal health as measured by the SVHI, VFI, and an acoustical assessment in in relation to demographics, vocal training, physiology, vocal loading, vocal hygiene, genres performed, and pathology?	Singer Questionnaire SVHI Survey VFI Survey VoxMetria CAPE-V	
3. Is there a difference between music teachers and non-music-teachers in each ensemble regarding their overall vocal health? Within the population of music educators from each ensemble, what are the beliefs of vocal health, and vocal training, technique and pedagogy, and repertoire selection as it relates genres performed and the vocal health of their ensembles?	Singer Questionnaire SVHI Survey VFI Survey VoxMetria	Semi-structured interviews Singer Questionnaire Open-Ended Question
4. What is the effect of genre on vocal fatigue within and between the two ensembles, particularly regarding traditional Kenyan and other African folk music set for choirs, Contemporary Commercial Music (CCM) arranged for choral ensembles, and Western traditional and contemporary choral canon?	EASE Survey	

of the voice. Additional instruments included the Ability to Sing Easily (EASE) (Phyland *et al.*, 2013), which was administered immediately following a singing activity and measured active vocal fatigue and potential signs of pathology in the moment. Acoustical assessment was performed using VoxMetria (1.0.7, CTS Informática, Pato Branco, Paraná, Brazil), acoustical measurement software which measured Irregularity (using jitter, shimmer) and Glottal-to-Noise Excitation (GNE) which measured noise escaping the glottis while phonating. Eight participants were selected using a semi-stratified randomization process (Salkind, 2007) for interviews. In this process, the strata used was whether or not they were music educators, and if they consented to be interviewed. If they met both criteria, they were given a random number. A random number generator was used to select four participants from each ensemble. These interviews were recorded, and the speaking voices of the participants were analyzed for vocal fatigue using the clinical standard CAPE-V (ASHA, 2006).

Questionnaire. A singer questionnaire (Appendix B) was distributed to assess demographic factors as well as self-reported information regarding physiological aspects of the vocal mechanism, vocal pedagogy and training, vocal loading, vocal hygiene, genres sung, and background regarding past medical issues, or potential pathology of the vocal mechanism. It was adapted from questionnaires used in other relevant studies (Donahue *et al*., 2014; Erickson, 2012; Garcia & Lopez, 2017; Hackworth, 2009; Kirsh *et al*., 2013; Roy *et al*, 2004). The questions were designed to provide a clear understanding of each participants' background and behaviors.

Singing Voice Handicap Index (SVHI). The 36-item SVHI (Appendix C) assessed the self-reported psychometrics of singers' level of dysphonia and the overall vocal health of the singing voice with a 5-point Likert rating scale from 0 (never) to 4 (always). The lowest raw

score possible (0) indicated the complete absence of dysphonia, while the highest raw score (144) indicated a higher level of dysphonia, or vocal disorder. The raw score was then scaled from 0 to 100 by multiplying the raw score by 100, and then dividing it by 144 (Cohen *et al*., 2007). This equation produced the final SVHI score. The lower the number, the less presence of vocal disorders, or dysphonia. Two additional items were included that assess the talkative nature of the participant, as well as a criterion-related validity item that was often used to comprehensively assess a participants' overall feelings about the nature of their perceived voice disorder (Baylor Institute for Rehabilitation, n.d.). The SVHI was found to have high test-retest reliability (Spearman correlation r_s = .92). Internal consistency demonstrated a Cronbach's α of .97 (Cohen *et al*., 2007).

Vocal Fatigue Index (VFI). The Vocal Fatigue Index (VFI) (Nanjundeswaran *et al*, 2015) was a 19-item instrument that measured overall vocal fatigue (Appendix D). The VFI assessed the speaking voice, which was important for a comprehensive study of professional voice users such as singers and educators. The authors stated that vocal fatigue was not universally defined but was a symptom of increased vocal effort over time and was a phenomenon that clinicians and otolaryngologists regularly treat. This instrument was developed with the purpose of providing a standardized tool that would reliably identify individuals with vocal fatigue, define vocal fatigue and provide a cohesive baseline for common language and characteristics of vocal fatigue, as well as a measure of the effect of vocal fatigue for clinical use. The VFI used a 5-point Likert-scale on three factors: Factor 1 (questions 1-11) measured the overall tiredness of the voice and avoidance of use as a result. Factor 2 (questions 12-16) measured the overall physical discomfort when using the speaking voice, and could be an indicator of pathology within the mechanism. Factor 3 (questions 17-19) was reverse scored,

with higher scores indicating that the voice improved with rest. Therefore, each factor was a separate measure, and there was no composite VFI score. In the original validated study, the VFI was found to have strong test-retest reliability as seen for factors 1 ($r = .94$) and 2 ($r = .90$). The reliability for factor 3 was considerably weaker ($r = .30$) but was nonetheless significant ($p < .01$). A logistic regression analysis was performed to determine the sensitivity of the index with each factor, and showed statistically significant results (Chi-square = 35.505, $p < .001$ with degrees of freedom = 8) with an R^2 of .80. This indicates that the test reliably is able to accurately distinguish those with and without complaints of vocal fatigue (Nanjundeswaran *et al.*, 2015).

Ability to Sing Easily (EASE). To assess current vocal status, specifically as it related to vocal fatigue and vocal load in the singing voice, the Ability to Sing Easily (EASE) was created (Phyland *et al.*, 2013). This 20-item survey quickly assessed vocal fatigue and Pathologic-Risk Indicators within the moment using a 4-point Likert scale (Appendix E). It allowed for immediate self-assessment after singing and was specifically created for the singers' voice. It was designed for those who sing Musical Theatre, a genre considered by many as part of the CCM umbrella of genres. A Rasch analysis was used to define the ideal subscales to fit the two subsets of items identified in a principal component analysis, which showed two components (Phyland *et al*., 2013). The first subset of 10 questions were indicative of the physical symptoms of vocal fatigue (Subscale 1), and the other subset was 10 questions indicating potential pathology or edema within the voice (Subscale 2). The authors stated that the two factors may be used separately or combined for a raw score and provided a Rasch converted score scaled from 0-100 if the survey was used in whole. The authors found that "the overall fit to the model was satisfactory ($p = .04$) with support for the unidimensionality of the combination of the two

subtests" (p. 458), but also indicated that subtests can be scored separately. The subset that measured vocal fatigue (Subscale 2) included three novel descriptors which were reverse scored, as they word the questions positively, and a lower score indicated fatigue. For the purpose of this study, the subscales were used separately. Subscale 2 was used as a pre- and post-test to measure potential pathology of the voice both before and after the singing trial. Subscale 1, which measured vocal fatigue, was administered three times to assess the fatigue of the voice after singing specific genres for a period of time.

VoxMetria. After the participants had participated in the singing trial, an acoustical evaluation was performed to determine a multiparametric analysis of the voice. The VoxMetria mobile application (Behlau, 2017) for the iPad provided an acoustical analysis of the speaking voice. The protocol according to instructions provided by the manufacturer stated that the software was designed to be used with the iPad microphone only, with no external microphone. Following standard protocol, the iPad was held 30" away from the mouth of each participant, who were instructed to use a comfortable loudness and pitch during the recorded vocal task of sustaining the /ɛ/ vowel. The software provided Fundamental Frequency (F0), or average speaking pitch, irregularity (which was measured using jitter and shimmer), and the glottal-to-noise excitation ratio (GNE) (using a measure of noise that escapes the glottis during phonation).

Irregularity was determined by the variations that occur in the fundamental frequency of the voice using both jitter and shimmer. Jitter was the period perturbation quotient, and measured vocal stability. It was affected by a lack of control of the vocal fold vibration, and increased with dysphonia, resulting in hoarseness, or a harsh, rough vocal quality. Shimmer represented the energy perturbation quotient, or amplitude instability. It was affected by the reduction of glottal resistance, and a normal voice has a smaller amount of instability with sustained phonation on a

single vowel. VoxMetria reported an irregularity score using jitter and shimmer which provided a correlation between the two, or waveform matching coefficient, with a range of 0.0-4.75 to be considered normal, and a threshold of 10.00 to be considered as unhealthy.

Noise was measured using the GNE ratio which indicated the source of the vibrations as being from the vocal folds or from turbulent noise from within the vocal tract (Michaelis *et al.,* 1997). The Glottal-to-Noise-Excitation ratio was indicative of the ability of the participant to coordinate both source (or the air) and the filter acoustics (vocal folds). In other words, GNE measured glottal air leakage, or breathiness of the voice. VoxMetria provided a range of 0.5-1.0, with the norm falling between 0.5-1.0. For each participant analyzed, VoxMetria provided a visual Phonary Deviation diagram showing where the voice fell within the spectrum of possible scores (see Figure 3.1).

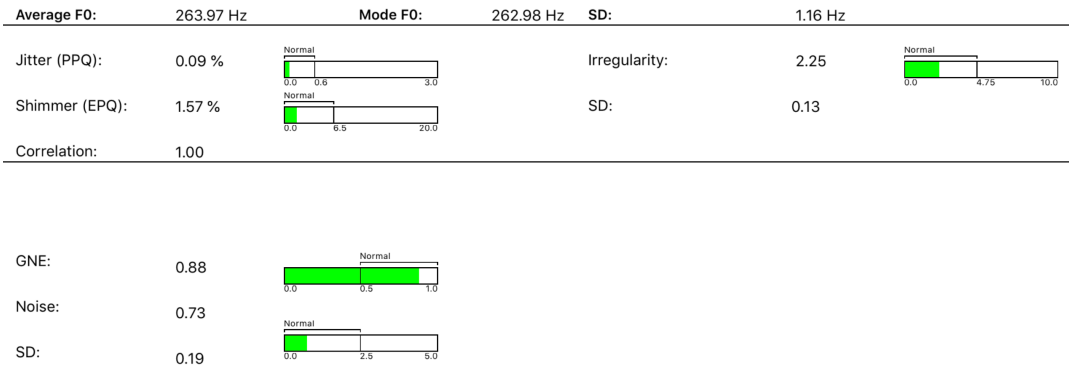

Figure 3.1. Sample VoxMetria Diagram.

Consensus Auditory-Perceptual Evaluation of Voice (CAPE-V). The Consensus Auditory-Perceptual Evaluation of Voice (CAPE-V) (ASHA, 2006) allowed for auditory perception of the voice by clinicians and was intended to be used in conjunction with other tests of speaking vocal function. It has a very strict protocol (Appendix F) that assessed roughness, breathiness, strain, pitch, and loudness as well as provided an overall score from 0 to 100. A

score of voice quality deviation was assessed by the evaluator using a 10-cm analog linear scale where “0” meant no issue and “100” meant severe vocal dysphonia. The scale also has additional anchor points of mild, moderate, and severe deviation for the evaluator to categorize the results based on the score. Only four participants from each ensemble were recorded and assessed with this instrument following the CAPE-V protocol and the recordings were analyzed using inter-rater reliability measures by an expert panel using the CAPE-V form (Appendix G).

Qualitative Instruments. Qualitative methods for this Mixed-Methods Design (Creswell & Plano Clark, 2018) included an open-ended question on the initial questionnaire defining vocal health and the semi-structured interviews of four music teachers and the artistic directors of each ensemble.

Questionnaire. How singers define healthy singing can be very revealing with regard to their vocal training and knowledge of the vocal mechanism. The answer to this one question can be seen as the foundation of their pedagogical approach to voice training, In the questionnaire, each participant was asked the question, “How do you define healthy singing?” There was no limit on characters, and allowed each participant to define and qualify what that statement meant to them.

Semi-Structured Interviews. To provide an in-depth analysis of the knowledge and beliefs regarding vocal technique, how it was taught (vocal pedagogy), and the role of repertoire selection as it related to how music educators teach vocal technique, eight of the music teacher participants were interviewed, as were the conductors of both ensembles. These interviews were used to determine the participants’ views on vocal health and singing technique, perceptions of vocal fatigue when singing in various genres, and whether informal singing or formal singing impacted perceived vocal fatigue. Interview questions were regarding perceptions of vocal

health, standard vocal training and pedagogy taught within their school curriculum, the state of their personal vocal health, as well as questions regarding vocal techniques used when singing varying genres, and vocal fatigue within these genres (Appendix H). All interviews were audio recorded, transcribed, and coded using inductive and deductive analysis (Patton, 2015).

Procedures

This concurrent transformative design study (Creswell, 2013) took place in June and August 2018 in Kenya and the United States (see Figure 3.2). A sequence of data collection events was presented for Institutional Review Board approval at the University of South Florida (Protocol #00035486) (Appendix I). Participating members of the two ensembles, the Nairobi Chamber Chorus (NCC) (n = 25) from Nairobi, Kenya, and the Festival Singers of Florida (FSOF) (n = 69) were invited to complete the informed consent beginning on June 9th, 2018 , as well as the singer questionnaire, the Singing Voice Handicap Index (SVHI) (Cohen, *et al*. 2007), and the Vocal Fatigue Index (VFI) (Nanjundeswaran *et al*, 2015) using the online survey database Qualtrics (Qualtrics, Provo, UT).

On Tuesday, June 26th and Friday, June 29th, 2018 two rehearsals (Trial 1 & Trial 2) were held in Nairobi, Kenya for NCC members only, with both rehearsals from 7pm-10pm. These two rehearsals were not regularly scheduled rehearsals, and were called as extra rehearsals to prepare for upcoming performances. The repertoire was selected by their conductor and fit into three genres: Western choral, Folk and Traditional, and CCM (Appendix J). For Trial 1 (n = 16), the choir warmed-up for 10 minutes led by their Artistic Director, Ken Wakia, and then were given a 10-question pre-test using the Ability to Sing Easily (EASE) (Phyland *et al*., 2013) subset of questions (Subscale 2) to provide a current indicator of vocal pathology or edema, or swelling (Phyland, *et al*., 2013).

Vocal fatigue can be evident after a vocal loading time between 17 minutes and 45 minutes (Titze *et al*., 2003), depending on levels of training and hydration, which can allow for comfortable singing for an upward of 101 minutes without feeling fatigue (Yiu & Chan, 2003). The choir therefore rehearsed their scheduled repertoire beginning with the traditional Western choral repertoire as chosen by their Artistic Director for 32 minutes, followed by the 10-question EASE (Phyland *et al.*, 2013) assessment (subscale 1) which assesses the participants' vocal fatigue in the moment. The choir then rehearsed traditional Kenyan or other traditional folk music from Africa for 32 minutes, then completed the EASE Subscale 1 to assess their fatigue in that moment. Lastly, the choir rehearsed for another 32 minutes, this time rehearsing Western CCM repertoire that they were preparing to perform, and once more completed the EASE Subscale 1 to measure fatigue. This was immediately followed by the EASE Subscale 2 to measure the vocal pathology or edema index at that moment as a post-test.

Trial 2 for NCC (n = 17) on June 29th followed the same format, with the only differences being different repertoire as selected by the conductor (Appendix J), and the order of genres being reversed within the blocks of time, still beginning with traditional Western choral repertoire, followed by Western CCM music, and lastly with traditional Kenyan or other traditional music from Africa. The reverse order was done to compensate the order effect of the genre and its impact on fatigue. Because these rehearsals were considered extra rehearsal outside of the normal rehearsal time, not all participants were able to be at both rehearsal trials. A total of nine participants from NCC were present for both rehearsals (n = 9) and twenty-one (n = 21) completed all components of the study.

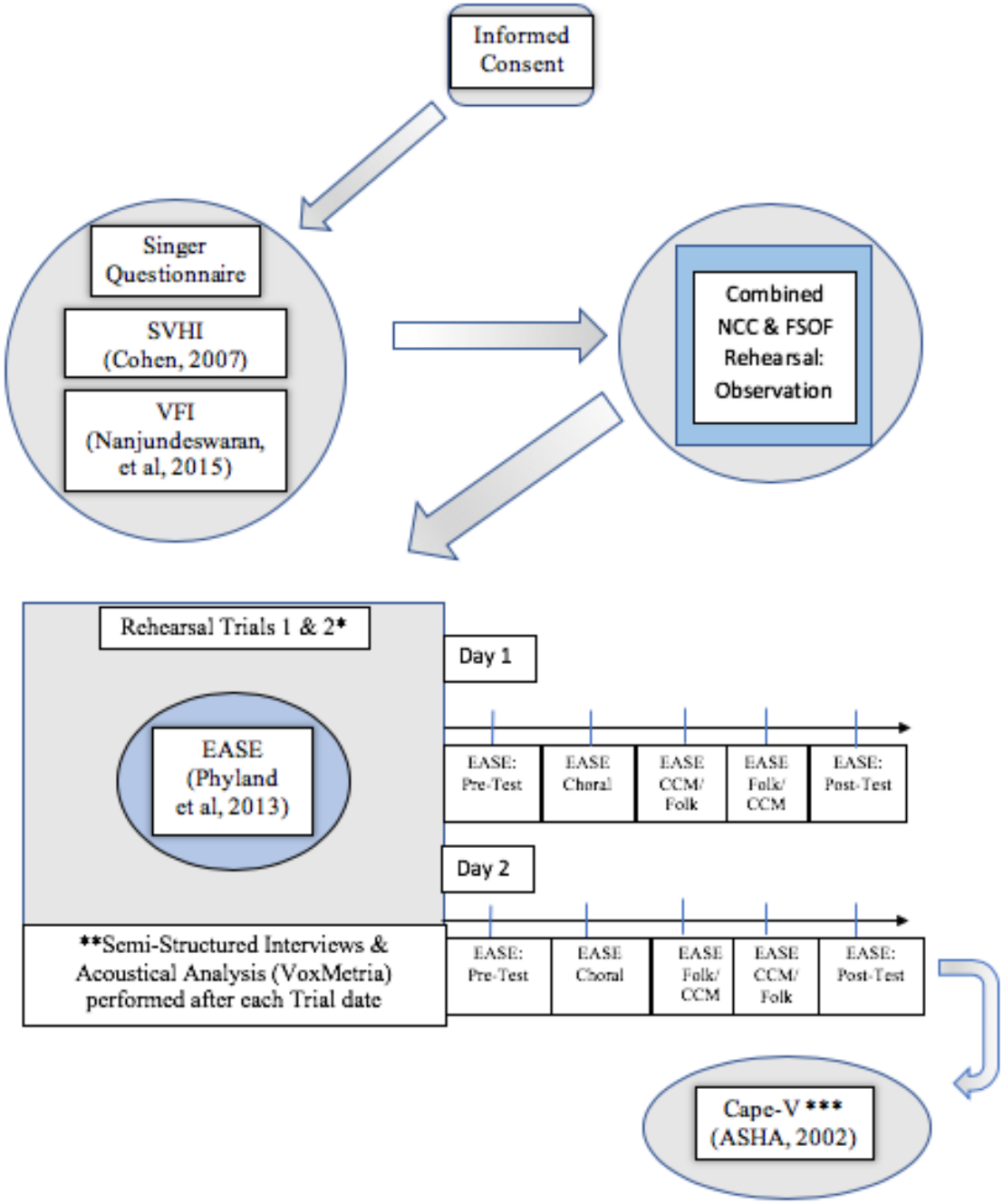

Figure 3.2. Study Design.
*The rehearsal trials will be performed with both ensembles separately
**Participants were split in half so that interviews and acoustical assessment were spread across both Trial dates
***The CAPE-V Index will be used to assess only the voices of those who are being interviewed

Following the rehearsals, each participating member had an acoustical evaluation of their voice after singing using the VoxMetria software (1.0.7, CTS Informática, Pato Branco, Paraná, Brazil) on an iPad Pro (Behlau, 2017). Half of the participants were assessed after the first trial, and the other half after the second depending on their availability. According to the protocol of the software, each participant sustained the /Ɛ:/ vowel for as long as they were able. The software then provided an immediate analysis of their average Fundamental Frequency (F0), Irregularity (jitter, shimmer), GNE (Noise), as well as providing the duration of the sustained vowel. Per software protocol, an external microphone was not used, as the iPad version of the software is specifically designed to work with the iPad microphone. The iPad was held 30" away from the participants' mouth per standard protocol to ensure consistency of the sound. Care was taken to ensure as quiet a room as possible at the rehearsal site and under 50dB as measured with the Decibelk X Pro app (6.5.1, SkyPaw Ltd.) as a sound-proof room was not available.

All participants had the opportunity within the questionnaire to volunteer to participate or to decline participation in an interview regarding their vocal health. Criterion for being interviewed was based on a positive response to being interviewed within the survey as well as the occupational criteria of being a music teacher. All who met these requirements were subjected to stratified randomization, where each participant who met the criterion were each assigned a number, and numbers were selected using a random number generator (Fast Random Number Generator, 4.0.8, Big Sauce LLC). Four participants from each ensemble were selected using this stratified randomization model (Salkind, 2007), based on the strata of being a music educator. Two of the selected participants were interviewed on each trial date after the rehearsal period using a semi-structured interview approach, allowing for clarification as needed. Four participants total were interviews over the course of the two trials.

The same protocol was used on August 11th and 12th in Orlando, FL with the other participating ensemble, the Festival Singers of Florida (FSOF). Due to the rehearsal schedule in place, there were some alterations to the protocol. The time of day for the two rehearsal trials was different, as the scheduled rehearsals were from 9am-11am in the morning and on subsequent days rather than spaced apart by 3 days as the NCC rehearsals had been. Additionally, the FSOF participants sang the 32-minute rehearsal blocks in a different order, with 32 minutes of traditional Western choral repertoire followed by Western CCM, and lastly traditional Kenyan or other traditional music from Africa as the final 32-minute block in Trial 1 (n = 55). To control for the combined effect of genre, Trial 2 reversed this order with traditional Western choral repertoire followed by traditional Kenyan or other traditional music from Africa, and Western CCM as the final 32-minute block for FSOF participants (n = 48). Forty-three participants from FSOF completed all components of the protocol (n = 43). FSOF sang the repertoire that their Artistic Director had chosen for them, and there was no overlap in repertoire between NCC and FSOF, merely genre.

As with NCC, members of the FSOF had an acoustic assessment of their voice after the singing trial using VoxMetria on either Day 1 or Day 2, depending on their availability. Likewise, those music teachers selected using the same criterion and stratified randomization process as with NCC were interviewed using the same protocols. All interviews were recorded, transcribed, and coded. An analysis of the vocal quality of the music educator participants from both ensembles was performed using the Consensus Auditory-Perceptual Evaluation of Voice (CAPE-V) (ASHA, 2006), and analyzed by an expert panel for inter-rater reliability. Additionally, the Artistic Directors of both ensembles were interviewed using a semi-structured interview process.

Vocal Health Questionnaires. The Singing Voice Handicap Index (SVHI) total score and the three subscales of the Vocal Fatigue Index (VFI) were used as comprehensive self-reported measures to assess the level of dysphonia in the participants' singing and speaking voices.

Preparing the Singer Behavior Questionnaire for Analysis. The questionnaire provided a comprehensive overview of the participants' perceived vocal state, behaviors, and personal history. For analysis purposes, each question was classified into the categories of demographics, training, genres performed, physiology, vocal load, vocal hygiene, and pathology. The questions were randomized throughout the survey with some questions reworded to confirm reliability of the responses.

The protocol outlined was used to determine each groups' definition of vocal health, to assess the overall vocal health of these choral singers from the United States and Kenya by measuring their levels of dysphonia in their speaking and singing voices, to ascertain whether singing particular genres has any significant impact on the singers' vocal fatigue, and to analyze these factors in music teachers from both groups in order to identify how these variables may impact both their vocal health and that of their students. The following chapter presents the results.

Chapter 4: Results

The purpose of this study was to explore the vocal health of choral singers from Kenya and the United States by measuring dysphonia in adult, semi-professional choral singers and to determine whether genre had an impact on healthy vocal production, particularly as it related to vocal fatigue. An additional purpose was to analyze how music educators from both ensembles addressed vocal technique and repertoire selection as they related to genre, vocal health, and fatigue. The results of the quantitative and qualitative data were analyzed and interpreted based on a Mixed-Methods Concurrent Transformative Design (Creswell & Plano Clark, 2018). The research questions were:

1. How do semi-professional choral singers from the United States and Kenya define healthy singing?
2. What is the overall vocal health of members of the Nairobi Chamber Singers in Kenya and the Festival Singers of Florida in the United States? What is the relationship between overall vocal health as measured by the SVHI, VFI, and an acoustical assessment in relation to demographics, vocal training, physiology, vocal loading, vocal hygiene, genres performed, and pathology?
3. Is there a difference between music teachers and non-music-teachers in each ensemble regarding their overall vocal health? Within the population of music educators from each ensemble, what are the beliefs of vocal health, and vocal training, technique and pedagogy, and repertoire selection as it relates genres performed and the vocal health of their ensembles?

4. What is the effect of genre on vocal fatigue within and between the two ensembles, particularly regarding traditional Kenyan and other African folk music set for choirs, Contemporary Commercial Music (CCM) arranged for choral ensembles, and Western traditional and contemporary choral canon?

A response rate of 80% was attained in the Nairobi Chamber Chorus (n = 20) for all instruments, and 86% of the Festival Singers of Florida (n = 59). Table 4.1 presents the number of participants who completed various instruments in both choirs.

Table 4.1

Data Collected Per Group

Instrument	FSOF Frequency (%)	NCC Frequency (%)
Singer's Questionnaire	67 (97)	25 (100)
SVHI	69 (100)	25 (100)
VFI	67 (97)	25 (100)
Acoustical Analysis	62 (90)	21 (84)
EASE	64 (93)	23 (92)
All Instruments	59 (86)	20 (80)

Note: NCC (n = 25), FSOF (n = 69), Total (N = 94)

Descriptive data

Descriptive statistics were used to summarize participant demographics with age, sex, education level, race, as well as singing/ensemble related information such as voice part.

Demographics of participants. The Nairobi Chamber Chorus (NCC) (n = 25) and the Festival Singers of Florida (n = 69) were selected for this study primarily because though they were from different countries and have different levels of training, they were both well respected, sought after, and were considered by many to be well trained, skilled, and talented musicians. Both groups sang a variety of choral genres and styles, with their primary genres including

Western traditional and contemporary choral canon, genres within the CCM domain, and traditional folk music of varying cultures including that of Kenyan background that were arranged for choirs. NCC was founded in 2005, and FSOF in 2008, and their membership has been fairly consistent with fairly equal distribution between experienced and newer members.

Singing background and voice training. Sixteen percent of all participants were amateur singers that sang as a hobby, 5.5% received a portion of their income from singing, and 5.5% were studying to become professional singers, while 77% sang professionally (including music educators). Table 4.2 breaks these total percentages down for each ensemble grouping.

Table 4.2

Demographic Data of Participants

	Category	FSOF Frequency (%)	NCC Frequency (%)
Singing Type	Hobby/Amateur	4 (6)	11 (44)
	Studying to be Professional	2 (3)	3 (12)
	Semi-Professional	2 (3)	1 (4)
	Professional	61 (88)	10 (40)
Years in Ensemble	<1 Year	20 (29)	8 (32)
	1-2	16 (23)	2 (8)
	3-4	16 (23)	6 (24)
	5-10	17 (25)	9 (36)

Note: NCC (n = 25), FSOF (n = 69), Total (N = 94)

Both ensembles have a similar number of new members with 29% of FSOF participants and 32% of NCC participants being new to their respective groups (< 1 year). Sixty percent of NCC participants and 48% of FSOF participants have been in the ensemble for 3-10 years. More members within the NCC sample consider themselves amateur singers (44%). Eighty-eight percent of the FSOF members are professionals in their field, while 40% of NCC participants attain their income by being professional musicians.

Both groups in this sample had more soprano and lower male voice participants than other voice parts (Figure 4.1). Within the sample of treble voices (soprano, mezzo soprano, and altos), sixteen participants from FSOF defined themselves as mezzo sopranos, with only one participant self-identifying as an alto.

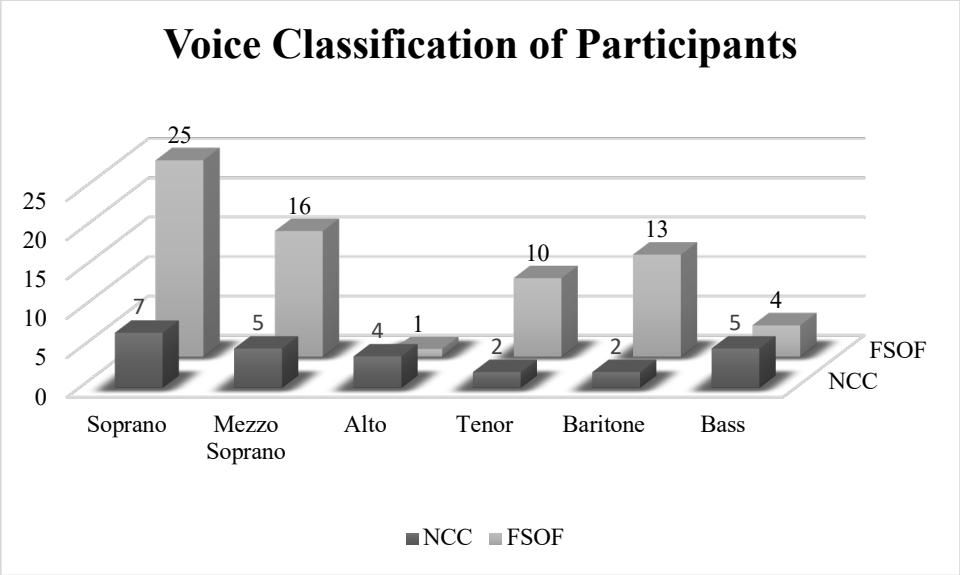

Figure 4.1. Frequency of voice classifications of NCC and FSOF Participants.

Participants from NCC and FSOF have a vastly different experience with regard to vocal training (Appendix K). Within the questionnaire, participants were asked if they had knowledge of their range, tessitura, and extension without any explanation or definitions provided. While 60% of the NCC participants felt confident in this knowledge, 96% of the FSOF participants felt the same. Eighty-seven percent of FSOF participants received voice training in a school setting, while only 48% of NCC participants reported voice training in school.

FSOF overall showed significantly more vocal training, and over a longer period of time. Fifty-eight percent (58%) of FSOF participants had a voice teacher when they began singing formally, and 94% of them have taken private voice lessons. Nearly ninety percent (89.9%) from

FSOF have had formal voice training for at least three years, with 69.6% have more than five years of formal training. Ninety-seven percent of FSOF participants have sung in formal ensembles for at least 5 years, with 74% of them singing for 10 or more years. In contrast, only 20% of the Nairobi Chamber Chorus participants reported having a voice teacher when they began singing formally, and only 24% reported having had private voice lessons in the past. Thirty-six percent of the NCC participants have had one year or less of formal voice training, with another 44% having had none. The majority (80%) of the NCC participants have sung in formal ensembles between two to ten years. Both groups have less current participation in voice lessons, with 12% of the NCC participants currently in voice lessons and 10% of FSOF.

When asked if they warm-up prior to singing, 44% of NCC and 36% of FSOF reported that they sometimes warm-up, with 36% (NCC) and 52% (FSOF) reporting that they almost always warm-up. Only 3% of FSOF participants reported always warming up prior to singing, while 12% of NCC participants always warm-up. Data analyses are presented in the order of the research questions hereafter.

Research Question One: How do semi-professional choral singers from the United States and Kenya define healthy singing?

Participants were asked in an open-ended question on the singer's questionnaire how they define healthy singing. This was a required response in the questionnaire. The raw data of these results are provided in Appendix L. Results were thematically coded and analyzed (Gibbs, 2010). From their responses 115 codes were defined (Appendix M). These codes formed 14 categories for all participants (Appendix N). Using these categories, five themes emerged (Table 4.3). They were characteristics of healthy singing, physicality of healthy singing, training and knowledge

for “proper” use, manifestations of voice issues if singing incorrectly, and musical results of healthy singing.

Table 4.3

Themes and categories from open-ended question, “How do you define healthy singing?”

	Theme	Categories
Theme 1	**Characteristics of Healthy Singing**	• Sensations of singing in a healthy manner • Tone Quality Characteristics • Vocal Resonance
Theme 2	**Physicality of Healthy Singing**	• Breath Intake • Breath Management • Bodily Engagement • Lack of Tension
Theme 3	**Training and Knowledge for “Proper” Use**	• Knowledge of Vocal Mechanism • Vocal Hygiene • Verbiage indicating an understanding of voice production
Theme 4	**Manifestations of Voice Issues if Singing Incorrectly**	• Strain • Tension • Hoarseness • Fatigue • Pain • Pushing • Sore throat • Raspiness • Force • Voice cracks • Pinched • Struggle
Theme 5	**Musical Results of Healthy Singing**	• Correct vowel placement • Dynamic contrast • Intonation • Clear diction • Expression • Range expansion • Understanding of range and key signatures for the voice

Nairobi Chamber Chorus. The choir members of NCC were very conscious of the dangers of strain on the vocal mechanism. They primarily used warming up the voice, awareness of vocal range and tessitura within context of the music being performed, and monitoring of singing duration as tools to assist in monitoring vocal health (Table 4.4).

Table 4.4

Nairobi Chamber Chorus Thematic Results, "How do you define healthy singing?"

	Theme	Responses
Theme 1	**Characteristics of Healthy Singing**	Ease, **comfortable**, register adjustment, rich, power
Theme 2	**Physicality of Healthy Singing**	Maintains good **posture**
Theme 3	**Training and Knowledge for "Proper" Use**	**Correct technique**, Classical technique, sing in good health, **warm-up**, proper protocol, take care of the voice, using your voice well, monitoring range, monitoring time spent singing
Theme 4	**Manifestations of Voice Issues if Singing Incorrectly**	**Strain**, throat pain, overworked vocally, vocal cracks or breaks, pain, hoarse, sore throat
Theme 5	**Musical Results of Healthy Singing**	**Range** expansion, diction, dynamics, proper key signatures

* *Bolded words were common responses*

Participants from this group largely explained what *not* to do or very generally described healthy singing as singing with the "correct" technique without describing what they meant in detail. Eleven participants wrote specifically of avoiding vocal strain, and seven used verbiage to indicate singing with "good," "well-trained," "classical," or "proper" technique.

Festival Singers of Florida. The answers provided by the FSOF indicated that they were well versed in the concept of tension-free, supported singing taught in Western Bel Canto and Classical vocal techniques. Their responses largely focused on what *to do* to sing with a healthy singing technique (Table 4.5), as opposed to the participants from NCC who mainly described what *not* to do.

Table 4.5

Festival Singers of Florida Thematic Results, "How do you define healthy singing?"

	Theme	Responses
Theme 1	**Characteristics of Healthy Singing**	**Free**, highly **resonant**, **relaxed**, focused, balance of light and dark timbre, lifted soft palate, natural, open, effortless, forward, flexible, clear, vibrant, age appropriate, round, rich, warm, ease
Theme 2	**Physicality of Healthy Singing**	**Supported**, low and free breath, sustained and steady airflow, breath support, **tension free**, on the breath, relaxed jaw, neck, face, and throat, good posture, breath pressure ratio, on the breath, diaphragmatic and intercostal breathing, engaged core
Theme 3	**Training and Knowledge for "Proper" Use**	Drinking water, cords together, musculature, low larynx, vocal folds, glottal closure, **proper**/appropriate/good/correct **technique**, consistent, Foundation, strong understanding
Theme 4	**Manifestations of Voice Issues if Singing Incorrectly**	Over singing, pushing, pain, **fatigue**, **discomfort**, tightness, force, **damage**, pressure, strain, pinch, stress, struggle
Theme 5	**Musical Results of Healthy Singing**	Expression, range, vowel placement, intonation

***** *Bolded words were common responses*

The responses provided by FSOF participants were more technical in nature. They reflected the Western classical pedagogy and best practices vocal strategies and terminology that were

commonly taught in the United States in many educational settings, particularly in higher education classes for vocal musicians.

Neither group focused heavily on vocal hygiene within their definitions, and very few participants in either group who used the terms "proper" or "correct" technique to define what they meant. The majority of the responses by FSOF participants centered around Theme 2 (physicality of healthy singing), with in-depth responses regarding specific behaviors that they associate with healthy singing. Behaviors related to breath intake and support and being tension-free in the areas of the body surrounding the larynx and used in vocal production were most commonly discussed. Only one NCC participant had a comment that defined healthy singing in relation to Theme 2, and that was related to posture. NCC participants' comments were more focused on Theme 4 (manifestations of voice issues if singing incorrectly), while only a few of the FSOF participants discussed what it means to sing healthily by addressing these concerns within their definition of healthy singing. While participants from both ensembles emphasize the need for proper singing techniques, FSOF participants were much more specific and detailed with their responses, especially as it relates to what *to* do. NCC participants responded with broad, general statements when defining healthy singing, and mostly focused on what *not* to do.

Research Question Two: What is the overall vocal health of members of the Nairobi Chamber Singers in Kenya and the Festival Singers of Florida in the United States? What is the relationship between overall vocal health as measured by the SVHI, VFI, and an acoustical assessment in in relation to demographics, vocal training, physiology, vocal loading, vocal hygiene, genres performed, and pathology?

Overall vocal health was measured with six dependent variables: SVHI scores, VFI Scores (VFI 1 sub-score, VFI 2 sub-score, and VFI 3 sub-score), and acoustical measurement

scores (Irregularity and GNE scores). An analysis of these dependent variables along with independent group variables were conducted through the use of a 2 x 2 MANOVA. Additionally, a correlational analysis and hierarchical regression were performed to examine the relationship among the dependent variables of physiology, vocal training, vocal hygiene, vocal loading, genres performed, pathology, and demographic information.

Validity.

***Criterion-related validity*.** Criterion-related validity was established using the acoustical baselines assessed with VoxMetria and the established and widely used SVHI and VFI instruments. Correlation coefficients between the total scores of the three subscales of the VFI, SVHI, and acoustical baselines (Irregularity and GNE) are shown in Table 4.6.

Table 4.6

Criterion-Related Validity Using Pearson Product-Moment Correlation

	SVHI	VHI 1	VFI 2	VFI 3	Irregularity	GNE
SVHI	1					
VFI 1	.48**	1				
VFI 2	.45**	.69**	1			
VFI 3	.15	-.42**	-.38**	1		
Irregularity	.16	.27*	.23*	.19	1	
GNE	-.07	-.14	-.16	-.02	-.55**	1

Note: (N = 81)
*p < .05, two-tailed, **p < .01 two-tailed.

The Singing Voice Handicap Index (SVHI) is a self-reporting instrument which was used to measure vocal fatigue and pathology indicators in the singing voice. Another self-reporting instrument, the Vocal Fatigue Index (VFI) was used to measure fatigue within the speaking voice as a self-reporting measure. VFI subscale 1 measured avoidance of use of the speaking voice, VFI subscale 2 measures avoidance of use of the speaking voice, and VFI subscale 3 was reverse scored and measures improvement with rest. The SVHI, VFI1, and VFI2 have moderate to moderately high correlation coefficients, showing moderately similarity in what they are measuring. VFI3 is reversely scored, and is clearly measuring something different from SVHI. An acoustical assessment was performed by measuring irregularity (measured using jitter and shimmer) and GNE (Glottal-to-Noise Excitation ratio, or the measure of glottal noise). Irregularity and GNE are measuring different acoustical attributes because the correlation coefficients between them is negative (r = -.55) and their correlations with SVHI and VHI are low, only going as high as (r = .27). These findings justify treating these measures as separate measures in subsequent analyses.

Reliability. Internal consistency for each instrument was analyzed with Cronbach's Alpha. Additional analysis was performed with the comparison of Cronbach's alpha from the published original validation studies (Table 4.7). The internal consistency ranged from moderately to very high for each self-reporting instrument in the current study, and are indicative of internal consistency. Additionally, the internal consistency was moderately high (α = .71) for the acoustical measures (Irregularity and GNE). An analysis of Cronbach's Alpha revealed that internal consistency was highest when all items were included, without deleting any item.

Overall Vocal Health. To assess overall vocal health, fatigue-level and potential pathology of the speaking voice and the singing voice were included in the analysis. The voice of

Table 4.7
Reliability: Original Cronbach's Alphas (α) for SVHI, VHI1, VHI2, and VHI3 (Cohen et al., 2007; Nanjundeswaran et al., 2015) and Those of the Present Study

	SVHI	VHI 1	VFI 2	VFI 3
Original Studies	.97	.93	.89	.82
Present Study	.96	.87	.83	.79

each participant was also analyzed acoustically after they held a sustained sound on a comfortable pitch. This was analyzed to determine the jitter and shimmer of their voice, combined for a score named irregularity. The breathiness of their voices was analyzed with the GNE, or Glottal-to-Noise Excitation ratio.

Two-Way MANOVA. Research question two addressed the overall vocal health of the choir members. A 2 x 2 multivariate analysis of variance was performed to investigate overall vocal health differences in music teachers versus non-music teachers from both the Nairobi Chamber Chorus (NCC) and the Festival Singers of Florida (FSOF). Six dependent variables were used: the SVHI, the three factors of the VFI, and the two components of acoustical analysis (irregularity and GNE). The independent variables were music teacher versus non-music teacher status and NCC and FSOF choirs.

Preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance-covariance matrices, and multicollinearity, with no serious violations noted. An examination of Levene's Test of Equality of Error Variances yielded significance levels greater than .05 in all cases except GNE (p = .003). Based on this, a more stringent alpha was used for GNE results ($\alpha = .01$) (Tabachnick & Fidell, 2013). There was an overall significant difference ($p < .001$) between the choirs, $F(6, 72)$

= 11.89; Wilks' Λ = .50; partial *eta* squared = .62. This significance and large effect size warranted further exploration through univariate testing.

Univariate analyses (see Table 4.8) revealed that the dependent variables were not significantly different in VFI1 ($p > .05$) or VFI3 ($p > .05$); however, there was a significant difference in SVHI scores ($p < .05$), VFI2 ($p < .05$), and the two acoustical measures (Irregularity and GNE) ($p < .001$).

Table 4.8

Univariate Analysis of Variance between dependent variables

	Sum Square	*df*	*MS*	*F*
SVHI	853.57	1	853.57	*4.07
VFI 1	198.41	1	198.41	3.12
VFI 2	44.20	1	44.20	*4.15
VFI 3	18.99	1	18.99	1.58
Irregularity	72.48	1	72.48	***107.86
GNE	1.04	1	1.04	***33.27

* $p < .05$, *** $p < .001$

An inspection of the mean scores indicated that FSOF reported significantly lower SVHI, VFI2, and Irregularity scores than NCC, and significantly higher GNE scores (see Table 4.9).

Overall Vocal Health and Relationship to Predictor Variables. To examine the unique contribution of predictor variables such as vocal training, genres sung, physiology, vocal hygiene, vocal loading, pathology, and demographics in the explanation of overall vocal health, a hierarchical multiple regression analysis was performed for each criterion variable. Prior to conducing the regression, the relevant assumptions of this statistical analysis were tested. Firstly, a sample size of 94 was deemed minimally acceptable given seven predictor variables to be included in the analysis. The assumption of singularity was met as the predictor variables were

not a combination of any other independent variables and had no overlap. An examination of the correlations (Table 4.6) revealed that no correlations were

Table 4.9
Descriptive Statistics for differences between SVHI, VFI, Irregularity, and GNE (*N* = 81)

	Mean	*SD*	*n*	*Sk*	*Ku*
SVHI					
NCC	24.77*	16.35	21	1.40	2.58
FSOF	17.36*	13.78	60	1.35	1.83
Total	19.28	14.75	81	1.35	2.05
VFI 1					
NCC	15.24	5.98	21	-.73	-.43
FSOF	11.67	8.55	60	.69	.11
Total	12.59	8.08	81	.39	-.21
VFI 2					
NCC	4.29*	3.85	21	.62	-.48
FSOF	2.60*	3.04	60	1.32	1.27
Total	3.04	3.33	81	1.11	.50
VFI 3					
NCC	3.76	3.18	21	.28	-1.4
FSOF	4.87	3.56	60	.52	-.49
Total	4.58	3.49	81	.50	-.52
Irregularity					
NCC	5.53***	1.03	21	-.70	-.06
FSOF	3.37***	.74	60	1.15	4.17
Total	3.93	1.25	81	.88	-.10
GNE					
NCC	.50***	.23	21	.33	-1.06
FSOF	.75***	.15	60	-1.01	.51
Total	.69	.21	81	-.86	-.24

N = 81; Significant mean differences between groups * $p < .05$, *** $p < .001$

below .2 nor greater than .7, revealing that all coefficients were in the acceptable range. The collinearity statistics (i.e., Tolerance and VIF) were all within accepted limits.

Because hierarchical multiple regressions can only be run with one criterion variable, six regressions were conducted for each of the six criterion variables (SVHI, VFI 1, VFI 2, VFI 3, and acoustical measures of Irregularity and GNE) (See Figure 4.2).

To control for Type I error, a Bonferroni correction was used ($\alpha = .05/5 = .01$). With the Bonferroni correction, three of the criterion variables were found to have significance at the .01 level: SVHI, the acoustical measures of Irregularity, and GNE; however, none of the VFI

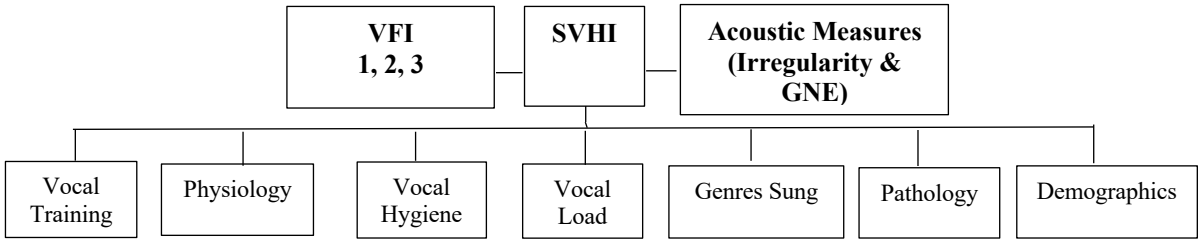

Figure 4.2. Hierarchical Multiple Regression Model.

subscales were significant at the .01 level, and are therefore not included in subsequent reports. Within the regression model, age, sex, and choir were entered into model one to control for these variables. The survey items that were identified in the correlational matrix as significant were entered into model two through model eight. With each regression, the predictor variables vocal training, genres sung, physiology, vocal hygiene, vocal loading, pathology, and demographic information were analyzed.

SVHI. The hierarchical multiple regression revealed that vocal training, genre, vocal loading, vocal hygiene, physiology, and pathology contributed significantly to the regression model ($F [57, 20] = 3.59$, $p < .001$) with an Adjusted R^2 of .66, accounting for 66% of the variance within the SVHI score ($\Delta F = .009$). This is a 65% increase from the 1% that age, sex, and choir predict ($R^2 = .012$). Predictors included:

- Model 2: Vocal Training (warming-up the voice, vocal training received in school, currently being in voice lessons, not having had any vocal training,

Fundamental Frequency average (F0), having had private voice instruction, amount of voice training),

- Model 3: Genres Sung (regularly sing CCM genres, choral genre causing greater fatigue, Classical/Bel Canto singing causing greater fatigue, no genre causing greater fatigue, primary genre sung, traditional folk singing causing greater fatigue, regularly sings traditional folk music, regularly sings in a Classical/Bel Canto style).
- Model 4: Vocal Loading (level of talkativeness, regularly exposed to noisy environments, number of hours of singing before feeling hoarse, number of singing hours per week, yells regularly, vocal load score).
- Model 5: Vocal Hygiene (tobacco usage, regularly uses decongestants, water intake, alcohol consumption, caffeine consumption, regularly uses throat lozenges, regularly eats late, regularly takes ibuprofen, regular sleep habits, regular exposure to smoky environments).
- Model 6: Physiology (frequent heartburn, acid reflux, voice being worse in the morning, frequent cough or tickle in the throat, frequent throat clearing, high stress, stomach ulcer, allergies).
- Model 7: Pathology (in the past three years having had recurring symptoms of frequent sore throat, frequent hoarseness, trouble singing, excessive dryness, trouble projecting the voice, increased effort to sing, trouble singing softly, running out of air when singing, pain when singing, vocal fatigue after singing, vocal discomfort, frequently singing flat, and decreased range).

Demographics of participants did not contribute to the model. The coefficients with significance for these predictors are shown in Table 4.10.

Irregularity. The hierarchical multiple regression revealed that demographics, genres sung, vocal loading, vocal hygiene, physiology, and vocal training contributed significantly to the regression model (F [62, 15] = 4.92, $p < .001$) with an Adjusted R^2 of .76, accounting for

Table 4.10

Summary of Hierarchical Regression Analysis for Variables Predicting SVHI Scores with Model 1 of Age, Sex, and Choir

Predictor Variables	*b*	SE (*β)*	*β*	*Adj.* R^2	Δ R^2	ΔF
Model 1 (Age, Sex, Choir)	- 25.90	26.33		.01	.05	.27
Vocal Training				.06	.14	.20
Formal Voice	- 7.00	3.00	- .71			
School Training	- 12.38	5.67	- .36			
Genre Sung				.10	.14	.23
Bel Canto/Classical Fatigue	15.51	5.40	.35*			
Vocal Load				.16	.11	.15
Load Score	4.63	1.49	.60*			
Talkative Score	- 2.06	1.00	- .27			
Hours Sing per Week	.47	.22	.34			
Vocal Hygiene				.15	.10	.53
Tobacco Usage	12.81	3.52	.45*			
Smoky Environments	- 17.59	7.25	- .36			
Physiology				.36	.19	.03
Acid Reflux	13.43	5.82	.39			
Frequent Sore Throat	37.266	8.82	.77***			
Frequent Throat Clearing	- 10.78	5.11	- .30			
Pathology in Past 3 Years				.66	.18	.00*
Loss of Range	- 17.79	8.33	- .51			
Trouble Singing	14.40	5.74	.38			
Vocal Discomfort	21.57	7.02	.56*			
Excessive Dryness	32.14	10.28	.58*			
Frequently Sings Flat	- 44.02	19.65	- .47			
Trouble Singing Softly	- 19.20	9.57	- .35			
Pain when Singing	- 19.32	8.15	- .40			
Runs out of Air Singing	- 11.15	5.30	- .27			

* $p < .01$, *** $p < .001$
N= 81

76% of the variance within the Irregularity score (ΔF = .03). This is a 28% increase from the 57% that age, sex, and choir predict (R^2 = .57). Predictors included:

- Model 2: Demographics (semi-professional singing, singing for less than 2 years in a formal setting, professional singing, singing for 10-20 years in a formal setting, studying to become a professional singer, amateur singing, singing for 2-5 years in a formal setting, singing for over 20 years in a formal setting, Fundamental Frequency average (F0), voice classification.
- Model 3: Genres sung (choral genre causing greater fatigue, no genre causing greater fatigue, regularly sing CCM genres, Classical/Bel Canto singing causing greater fatigue, primary genre sung, regularly sings traditional folk music, regularly sings in a Classical/Bel Canto style, traditional folk singing causing greater fatigue).
- Model 4: Vocal Loading (ability to sing 2-3 hours before getting hoarse, regularly exposed to noisy environments, ability to sing 3-4 hours before getting hoarse, number of singing hours per week, yells regularly, ability to sing greater than 4 hours without getting hoarse, ability to sing 0-1 hour before getting hoarse, vocal load score).
- Model 5: Vocal Hygiene score (decongestant usage, ibuprofen usage, lozenge usage, tobacco intake, caffeine consumption, alcohol consumption, water consumption, regular sleeping habits, regular exposure to smoky environments, frequently eats late).

- Model 6: Physiology (allergies, voice being worse in the morning, frequent throat clearing, acid reflux, frequent sore throat, frequent heartburn, stomach ulcers, high stress, frequent cough or tickle in the throat).
- Model 7: Pathology (in the past three years having had recurring symptoms of frequent hoarseness, excessive dryness, trouble projecting the voice, trouble singing softly, vocal fatigue after singing, trouble singing, running out of air when singing, frequently singing flat, increased effort to sing, vocal discomfort, decreased range, pain when singing).
- Model 8: Vocal Training (almost always warming-up the voice, formal voice training for 5-10 years, formal voice training for less than one-year, formal voice training for 1-2 years, formal voice training for more than 5 years, having a singing teacher when began singing, always warms-up, almost never warms-up, no formal voice training).

The coefficients with significance for these predictors are shown in Table 4.11.

GNE. The hierarchical multiple regression revealed that genres sung, vocal training, vocal hygiene, demographics, vocal loading, pathology, and physiology and contributed significantly to the regression model (F [60, 17] = 2.59, $p < .01$) with an Adjusted R^2 of .55, accounting for 55% of the variance within the GNE score ($\Delta F = .01$). This is a 15% increase from the 40% that age, sex, and choir predict ($R^2 = .40$). Predictors included:

- Model 2: Genres sung (regularly sing CCM genres, specific genres causing greater fatigue, primary genre sung).
- Model 3: Vocal Training (formal voice training for greater than 5 years, almost never warming-up the voice, formal voice training for 3-4 years, formal voice

Table 4.11

Summary of Hierarchical Regression Analysis for Variables Predicting Irregularity Scores with Model 1 of Age, Sex, and Choir

Predictor Variables	*b*	SE (*β)*	*β*	*Adj.* R^2	Δ R^2	ΔF
Model 1 (Age, Sex, Choir)	8.34	2.83		.57	.58	.00***
Demographics				.60	.09	.15
Choir	- 2.90	1.05	- 1.02*			
Studying to be a Pro. singer	- 1.51	.72	- .27			
Singing <2 Yrs. Formally	3.14	1.40	.29			
Singing 10-20 Yrs. Formally	- 1.25	.50	- .49			
Genre Sung				.56	.02	.89
Folk and Traditional World	- .80	.39	- .32			
Physiology				.54	.06	.43
Frequent Sore Throat	- 1.31	.64	- .32			
Frequent Heartburn	- 1.19	.54	- .36			
Pathology in Past 3 Years				.57	.08	.35
Frequently Hoarse	- .94	.35	- .37*			
Vocal Training				.76	.09	.03
Formal Voice for >20 Years	6.12	1.51	.56***			

* $p < .01$, *** $p < .001$
N= 81

- (*continued*) training for 1-2 years, almost always warming-up the voice, voice training in school, having a singing teacher when began singing, almost never warms-up, formal voice training for less than one-year, private voice lessons, no formal voice training).
- Model 4: Vocal Hygiene Vocal Hygiene score (decongestant usage, ibuprofen usage, lozenge usage, tobacco intake, caffeine consumption, alcohol consumption, water consumption, regular sleeping habits, regular exposure to smoky environments, frequently eats late).
- Model 5: Demographics (studying to become a professional singer, singing for 10-20 years in a formal setting, semi-professional singer, professional singer,

singing for less than 2 years in a formal setting, singing for 5-10 years in a formal setting, amateur singer, singing for 2-5 years in a formal setting, voice classification).

- Model 6: Vocal Loading (talkative score of 8 or higher, regularly exposed to noisy environments, number of singing hours per week, number hours sing before feeling hoarse, yells regularly, vocal load score).
- Model 7: Pathology (in the past three years having had recurring symptoms of increased effort to sing, frequently singing flat, decreased range, frequent hoarseness, trouble singing softly, running out of air when singing, pain when singing, excessive dryness, trouble projecting the voice, trouble singing, vocal discomfort, vocal fatigue after singing).
- Model 8: Physiology (voice being worse in the morning).

The coefficients with significance for these predictors are shown in Table 4.12.

In summary, the 2 x 2 MANOVA revealed that vocal health was significantly different between the two choirs, which led to a univariate analysis to determine which of the six vocal health variables contributed to the significance. Univariate testing revealed that the SVHI, Irregularity, and GNE scores contributed significantly to the difference in overall vocal health between the two choirs. An analysis done to determine which predictor variables from the singer questionnaire (vocal training, physiology, vocal loading, vocal hygiene, genres, performed, pathology, and demographic information) contributed significantly to these criterion variables (SVHI, Irregularity, and GNE). These predictors explained 76% of the variance of Irregularity, 66% of the SVHI score variance, and 55% of the GNE variance. These are large practical

differences, especially given the small sample size used in this study for the number of predictor variables.

Table 4.12

Summary of Hierarchical Regression Analysis for Variables Predicting GNE Scores with Model 1 of Age, Sex, and Choir

Predictor Variables	*b*	SE (*β)*	*β*	*Adj.* R^2	Δ R^2	ΔF
Model 1 (Age, Sex, Choir)				.40	.42	.00***
Demographics				.31	.06	.69
Age	- .02	.01	- .63			
Sex	- .70	.20	- 1.66*			
F(0) Average	.00	.00	.60			
Vocal Training				.35	.04	.95
Almost Always Warms-Up	- .45	.19	- .48*			
Professional Singer	- 1.20	.48	- .65			
Pathology in Past 3 Years				.12	.08	.92
Loss of Vocal Range	- .28	.13	- .58*			
Excessive Dryness	.38	.18	.49			
Physiology				.55	.20	.01***
Allergies	- .23	.09	- .55*			
Frequent Sore Throat	.43	.14	.63*			
Stress	.18	.08	.42*			

* $p < .01$, *** $p < .001$
Note: (*N*= 81*)*

Research Question 3: Is there a difference between music teachers and non-music-teachers in each ensemble regarding their overall vocal health? Within the population of music educators from each ensemble, what are the beliefs of vocal health, and vocal training, technique and pedagogy, and repertoire selection as it relates genres performed and the vocal health of their ensembles?

Each ensemble has a number of music educators that make up their ensemble. Forty percent of NCC and eighty-eight percent of FSOF are music educators. The same 2 x 2 MANOVA reported above was used to compare if there a difference between music teachers within each ensemble regarding their overall vocal health as measured by the VFI, SVHI, and acoustical measures (Irregularity and GNE). Additionally, four participants from each ensemble were selected using a stratified random sampling technique and were interviewed. All interviews were recorded, transcribed, and coded with a content analysis performed based on the research questions (Patton, 2015).

Music Teacher Participants. Of the music teachers in each ensemble (Table 4.13), 60%

Table 4.13
Music Teacher Status

Choir	Status	Frequency (*n*)	Percent (%)
	Music teacher of any subject		
NCC		10	40
FSOF		61	88
Total		71	100
	Music teacher that teaches chorus		
NCC		6	60
FSOF		55	90
Total		61	86
	Level Taught		
NCC	Pre-School	1	10
	K-5th Grade	3	30
	6-8th Grade	4	40
	9-12th Grade	2	20
FSOF			
	Pre-School	1	1
	K-5th Grade	5	8
	K-12th Grade	1	1
	K-College	1	1
	6-8th Grade	18	30
	9-12th Grade	30	49
	6-12th Grade	4	7
	College or University	2	3

Note: $N = 94$, Music Teacher $n = 71$

of those in NCC and 90% of those in FSOF teach chorus. The majority of music teachers (79%) in FSOF teach grades 6-12, or secondary school. Sixty percent (60%) of NCC participants teach the equivalent age group in Kenya, though it has a different designation within their educational system, called Forms 1-4.

Two-Way MANOVA. Results regarding the difference between the two choirs have been reported above already. This section reiterates the results with a focus on reporting results between music teacher and non-music teacher status (see Table 4.14).

Table 4.14

Two-Way MANOVA Results (N= 81)

Independent Variables	*Wilks' Lamda* Λ	*F*-value	Partial *eta*-squared
Main Effects			
Music Teacher	.96	.56	.05
Choir	.50	11.89***	.62
Interaction Effects			
Music Teacher * Choir	.93	.86	.07

*** $p < .001$

The main effect for music teachers versus non-music teachers was not significant, $F(6, 72) = .56$, $p > .05$; Wilks' Λ = .96; partial *eta* squared = 0.05. The main effect for choir (NCC versus FSOF) was significant, $F(6, 72) = .11.89$, $p < .001$; Wilks' Λ = .50; partial *eta* squared = 0.62 as reported above. Therefore, significance was found between the two choirs only. The interaction effect between music teachers versus non-music teachers and the choir that they represent was not significant also: $F(6, 72) = .86$, $p > .05$; Wilks' Λ = .93; partial *eta* squared = 0.07.

Qualitative Results. Research Question 3 also addressed the beliefs of the music educators from each ensemble regarding vocal health, vocal training, technique and pedagogy, and repertoire selection as it relates genres performed and the vocal health of their ensembles.

Music Teacher Interviews. On the questionnaire, one item asked if participants were willing to be interviewed. All who were both willing and stated that they were music educators were eligible to be randomly selected. Four from each ensemble were selected using a random number generator, and were interviewed with the questions centered around genre fatigue and vocal technique (Appendix H). Using a thematic content analysis, the interview transcripts were coded and analyzed (Patton, 2015). From their responses, 128 codes were used (Appendix O). These codes formed 29 categories (Appendix P). Using these categories, six themes emerged (Figure 4.3).

Participants. From the Nairobi Chamber Chorus, Louise, Albert, Marty, and Valerie were interviewed. From the Festival Singers of Florida, Toby, George, Samantha, and Jenny were interviewed. All names reported in this study are pseudonyms. The four participants from each ensemble consisted of two males and two females between the ages of 25-42 (29-42 years in NCC, 25-34 years in FSOF). All were music teachers and ranged in experience from 2.5 years of teaching to 16 years, though not all were teaching chorus. All four FSOF music educators were either middle school or high school choral directors with two of each. All four NCC music educators taught either general music, voice, piano, or musical theatre, all of whom taught singing instruction to some degree. The randomly selected participants were surprisingly well-matched. In addition to similar age ranges and sex make-up of each group, all of them have sung for at least five years formally, all have sung in their respective ensemble for at least 3 years, and all except one have had 3 or more years of private voice instruction. All eight of them were active performers and sang in ensembles outside of NCC or FSOF, respectively. An overview of the music educator participants dependent variable scores measuring their overall vocal health is found in Table 4.15.

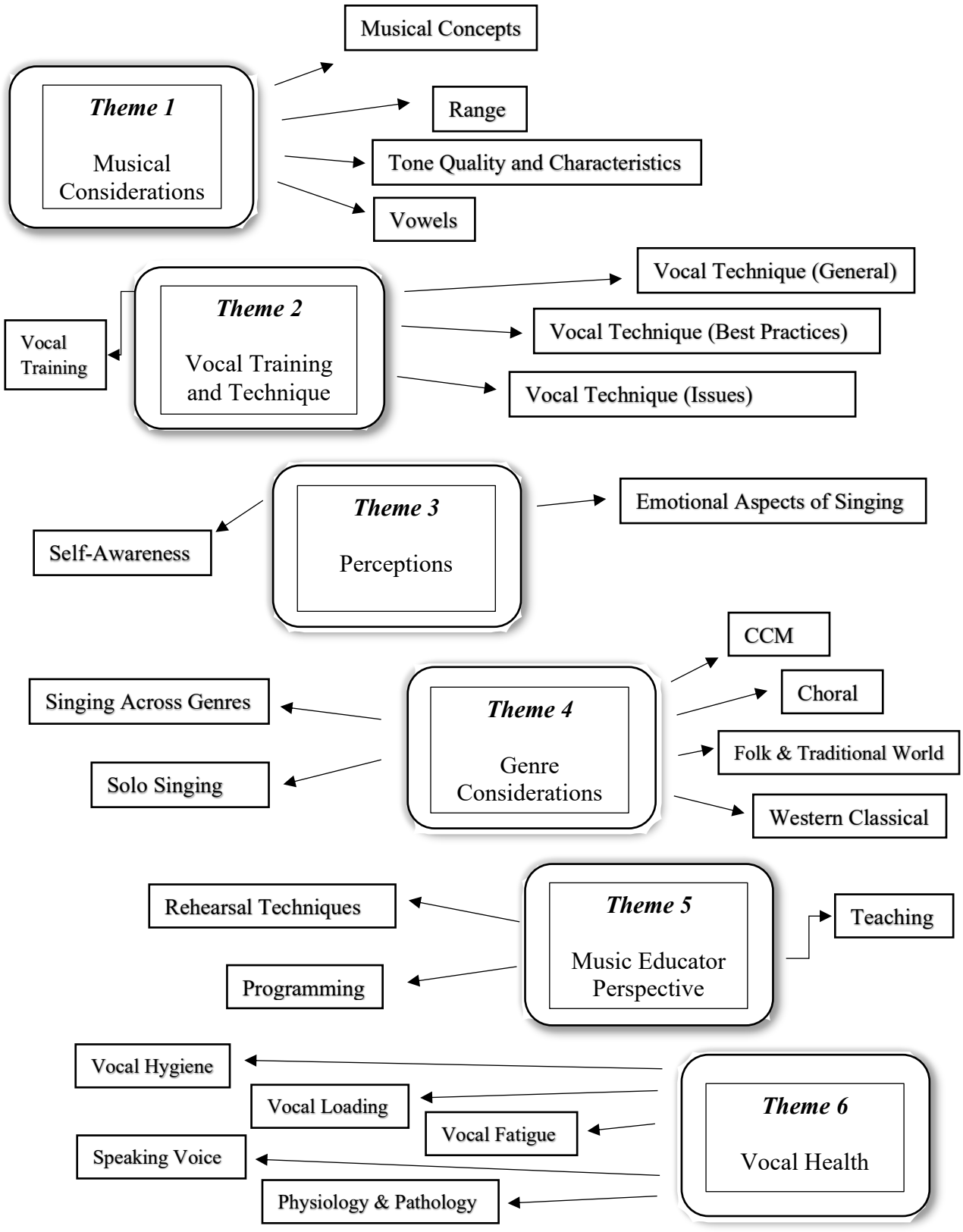

Figure 4.3. Content analysis themes and categories from NCC and FSOF Music Educator interviews.

Table 4.15

Dependent Variable Analysis of Music Educators Interviewed

	SVHI	**VFI 1** (Avoid Use)	**VFI 2** (Phys. Disc.)	**VFI 3** (Impr. Rest)	**EASE Pre-** PRI	**Choral** VF	**CCM** VF	**Folk** VF	**EASE** Post PRI	**Irreg.**	**GNE**
Albert (NCC)	35+	23**	8+	10+	N/A	N/A	N/A	N/A	N/A	5.74+	.76
Louise (NCC)	1	21**	0	12+	18**	17*	22**	20*	25**	5.44+	.34+
Marty (NCC)	32+	20**	8+	10+	12	17*	16	19*	21+	6.33+	.70
Valerie (NCC)	20	21**	3*	6**	0	7	11	6	3	6.04+	.16+
Jenny (FSOF)	11	6*	0	5	6	9	9	9	2	2.9	.75
Toby (FSOF)	30+	5	0	5	14	16	14	11	13	3.08	.79
Samantha (FSOF)	34+	29+	12+	12+	11	9	9	10	10	2.25	.88
George (FSOF)	19	13**	5**	5	14	14	11	14	9	3.26	.88

Mildly dysphonic*; Moderate dysphonia**, Severe/abnormal dysphonia score+

Norms of parametric instruments. Normal voices without vocal disorder is 20.65 for the SVHI, with 95% confidence levels from 10.6 to 30.10 (Sobol *et al*., 2018). For the VFI factors, Nanjundeswaran and colleagues (2015) originally found that the mean scores for Factor 1 (Avoidance of use) is 5.16 or lower in healthy individuals and 24.47 or higher for those with dysphonia. Factor 2 (Physical discomfort) mean scores are 1.44 and lower for those without disorder, and 6.39 for dysphonic voices. Factor 3 is reverse scored, and a lower score indicates that the individual's voice improves with rest. Vocally healthy individuals have a mean score of 5.8 or lower, and those with dysphonia have a mean of 7.71 or higher. Though recent studies have published updated norms (Hunter & Banks, 2017; Maedeh Moghtader *et al*., 2019), they are specific to certain populations, therefore the original guidelines are used to determine levels of dysphonia. In the EASE assessment, the scores for VF (subscale 1) stands for vocal fatigue and measures the level of fatigue for the singer in the moment. Subscale 2, PRI stands for pathologic risk indicators,

previously identified as vocal pathology. The norms for those without vocal dysphonia are 16 for VF and 14 for PRI, while the means scores for those with dysphonia are 27 for VF and 20 for PRI (Phyland *et al*., 2015). Regarding the acoustical assessment, irregularity norms are between .000 – 4.75, with a threshold of 10. Scores greater than 4.75 are considered abnormal. Normal GNE scores fall within the range of 0.50 – 1.00. Scores lower than 0.50 are considered abnormal and have high levels of noise, or breathiness in the sound.

Nairobi Chamber Chorus. Music teacher participants from NCC valued singing in multiple genres. They often spoke of the adjustment needed to sing in varying genres, frequently citing the difference between the natural, "open," wide approach to singing traditional folk music, and the "rounded" approach to singing in the Western classical and Bel Canto tradition, as well as to choral singing. When singing Western classical or contemporary choral genres they spoke of the strain that occurs when blending with others, or sustained singing in extreme ranges. Their results are presented in Table 4.16.

Vocal technique by genre. Several participants spoke of the challenge of adjusting their vocal technique to suit the genre. Louise stated, "Yeah, [vocal health] is a factor in singing multiple genres. I notice that there are some changes depending on style of how my voice is affected. There are some genres that if I do sing a little bit too much, it gets a little bit hoarse, and there are other…genres that are a bit easier on my voice." An overview of Louise's vocal health analysis can be found in Figure 4.4.

Regarding singing with a classical or Bel Canto approach, Albert said, I feel like Bel Canto has a lot of could I say technique or there's so much that goes into producing sound for a Bel Canto singer than just a normal genre because now they have to control. You have to really push your vowels forwards, you have to round your voice at the same time, I feel like personally,

I feel like they make their voices a bit darker or a bit...yeah, just a bit more resonant than the other genres.

Singer Spotlight: Louise, Nairobi Chamber Chorus

Louise sings for 35 hours per week, but has a fairly light vocal load throughout the day. She has had voice problems in the past, some of which have affected her career, and feels that she had a moderate problem, as she had been sick for the past month. Louise primarily sings CCM genres, which is the genre that she describes as being the most fatiguing. She can typically sing for four or more hours without feeling vocal fatigue. Louise's questionnaire for physiology and vocal hygiene indicated that she has some indicators that could present vocal concerns, such as frequent laryngitis, use of throat lozenges, less than ideal daily hydration, and mild consumption of caffeine, soda, and alcohol. She frequently eats late, has heartburn, and indicates that her voice is worse in the morning, an indicator of potential GERD or LPR. Though she has never seen a specialist regarding voice concerns, she has imposed vocal rest and has self-medicated when voice issues arise. Table 4.15 shows Louise's scores indicate that she presents mild to moderate dysphonia, and in some cases sever dysphonia. This may be due to the behaviors mentioned, or may be related to the fact that she had been ill for the month prior to this study. Louise's fatigue levels went from normal to severely fatigued throughout the singing trial.

Figure 4.4. Vocal behaviors and health overview of Louise, NCC member

Rounded vowels were brought up by several of the NCC participants in both the open-ended questionnaire and in their interviews. Albert described rounding in the following way, "Rounding [is] for the vowels to have the general blend of tone. So, having very tall vowels [when singing] as opposed to very wide 'cause now when normally we speaking, it's just normal speaking. We have wide vowels and tall vowels, so when you [are] singing you know, especially

with [conductor] Ken, he loves very tall vowels." Albert emphasized the natural voice used in singing traditional music.

Table 4.16

Nairobi Chamber Chorus Interview Content Analysis Results

	Theme	Responses
Theme 1	**Musical Considerations**	**Range**, **loud dynamics**, diction, intervallic relationships, chromaticism, timbre, tone quality, placement, head voice, **vowel placement**, **rounded vowels vs. open vowels, open voice.**
Theme 2	**Vocal Technique**	**Adjusting technique for the genre**, technique for lifelong singing and to avoid vocal issues, **similarities and differences in technique per genre**, **range**, **blend**, style, gospel, **open**, vocal health, **modeling vocal technique**, **hoarseness** by genre, forward placement, **vibrato**, preserving the voice, **warm-ups**, **loud singing**, **rounding vowels, belt,** tone quality, popular music, careless singing, casual, simpler, **natural voice**, safely, no damage, copying sounds, freedom, rounded voice, croaky, consciousness of vocal production, opera, **resonance**, sore throat, duration of singing, **CCM**, **traditional**, **choral**, larynx, dropped jaw, over singing
Theme 3	**Perception**	Enjoyment, sing freely according to emotion, expressive singing, caught up in emotion so forget technique, personal vocal technique, struggle teaching voice, informal singing, speaking voice when teaching tiring, singing to impress, training
Theme 4	**Genre Considerations**	Exposure, enjoyment, versatility, quality, expand range, increase vocal skills, authenticity, prefer choir, preference, blend, rounding vowels, composer intent, following conductor's wishes, natural voice, variance, Western, Baroque singing, John Legend, register adjustment, fatigue, jazz, gospel, classical singing, popular, style,
Theme 5	**Music Educator Perspective**	Avoiding damage, **range**, **overuse**, misuse, discourage shouting, key awareness and singing range, weather factors, capability, **repertoire selection**, student preference, relate to CCM, incapable of Western traditional classical style, straining the voice, program all genres, correct voicing, range expansion, **imagery**, **space for resonance**, **modeling incorrectly**, **age appropriate**, duration of rehearsal, dropped jaw
Theme 6	**Vocal Health**	Loud singing, soreness, vomiting from singing too loudly, speaking voice, teaching all day, shouting, talking loudly, hydration, raised voice, **vocal fatigue**, **range**, **tessitura**, **high singing tires voice**, strained voice, stretching voice, dust, dryness, pollution, singing outside, no microphone, **duration of singing**

* *Bolded words were common responses*

So, I find if I'm singing in a choir, I end up really trying to do that blending and rounding my vowels. If I'm doing a solo, then now that's different, if I'm doing now my own Kikuyu folk song 'cause I am a Kikuyu. We have very open voices… So, if I was to do a Kikuyu folk song, if I sing it with a rounded voice, they will wonder what I'm doing. If I was to solo a folk song now, I will just do it the way we do it, back in the village.

Albert's vocal health and behaviors overview is found in Figure 4.5.

Singer Spotlight: Albert, Nairobi Chamber Chorus

Albert has had no formal vocal training outside of NCC. He only sings for 5 hours per week, but has a moderate vocal load throughout the day as a music educator. He has had voice problems, some of which have affected his career, but feels that it is only a mild problem. Albert primarily sings CCM genres, which is also the genre that he describes as being the most fatiguing. He can typically sing for only 1-2 hours before feeling vocal fatigue. Albert has a history of sinus infections and ulcers, takes decongestants, uses throat lozenges, and regularly gets less than 3-4 hours of sleep per night. He frequently eats late at night. He regularly uses tobacco products, and consumes mild amounts of caffeine and alcohol. Albert balances this by drinking 32-64oz. of water per day, but has concerns, such as a frequent sore throat and a persistent tickle or cough. In the past three years Albert has experienced vocal discomfort and frequently runs out of air when he sings. These factors impact his career at times. Albert has been to a medical doctor, and was diagnosed with tonsillitis. Table 4.15 shows Albert's scores, which indicate that he presents with severe dysphonia. He did not complete the data for the genre trial, however his acoustic analysis indicates that his GNE scores are within the normal range, and he does not present with a breathy tone.

Figure 4.5. Vocal behaviors and health overview of Albert, NCC member

Marty also used the term rounded, versus the more open tone that he used to describe singing in traditional folk music. Marty's vocal behaviors and overview are found in Figure 4.6. He stated,

> Yes, when I'm singing traditional genres, ah, it's mostly an open voice… because in traditional singing, the vowels are so mostly very, very open and loud, but sometimes in contemporary singing or even sometimes classical singing the vowels are not as open and they sound really, really closed up sometimes. For example, if I was singing a song in traditional singing and you will hear a lot more open vowels like, [a] (like apple) for example…so that's really different from what you will get in the traditional sense because the traditional sense gives you that really, wider, open [sound]. [The opposite of that] is mostly [a] (like in father]. In our Kenyan choral circles a lot of people say rounded voices, (laughs)- Yeah, that's the word that I would probably point to, rounded voices…And a little bit of classical.

Marty went on to talk about discerning when to use an open or rounded approach when singing traditional folk songs by saying,

> If you find an, ah, traditional African folk song that has been arranged in voices, it's very difficult that you'd find people singing it in the normal open voice. People would be singing it, most of us will be singing it in a, either classical or Bel Canto… traditional Kenyan music just requires your natural voice and also depending on the origin. Some traditional the vocal requirements, or rather the vocal qualities that are used to sing for example among the Maasai are probably different from what you get with the Luhyas, and probably different from what you get with the Giryamas on the coast, and probably also different from what you get with the Turkanas up north. So there's that a bit of

variance, but none of them actually gets close to the Bel Canto or the classical because that is borrowed from the west, (laughs).

Singer Spotlight: Marty, Nairobi Chamber Chorus

Marty carries a heavy vocal load as a singer and educator, singing 42 hours per week in addition to a moderate speaking vocal load. One issue that he faces is that as a music educator he works in a noisy environment. Marty reported that he has had mild vocal issues in the past, and states that he can typically sing for only 2-3 hours before becoming hoarse. His primary genre that he sings is choral music, but he indicated that singing in CCM makes him feel more fatigued. Marty suffers from acid reflux, likely from frequently eating late at night. He takes decongestants and ibuprofen as needed, and uses throat lozenges. He does consume caffeine, alcohol, and soda, but not frequently or in large quantities. Marty drinks 32-64oz of water per day. He often suffers from sore throats, especially for the two months leading up to the study, and often feels that his throat is excessively dry. He has experienced neck tension for several months, and these concerns have sometimes affected his career. While he has not gone to the doctor or to see a specialist, he has self-medicated as he navigates these concerns. Table 4.15 shows Marty's scores, which indicate that Marty suffers from mild to severe dysphonia in both his speaking and singing voice. His GNE scores were in the normal range. Marty's fatigue level increased as he sang through the singing trial, beginning in a normal range and increasingly becoming more fatigued.

Figure 4.6. Vocal behaviors and health overview of Marty, NCC member

Similarly, Valerie stated, "if I'm singing stuff that's Kenyan, I might be a little careless cause there's not rules and regulations to, 'Okay, this is how you're gonna do it.' And if it's arranged from traditional music we might just want to sing it really freely according to your emotion. If it's written in the Western style I'll try follow everything that the music instructs me to do… I'll

be very conscious about the sound I'm producing." Louise spoke on the difference of these genres to CCM styles and genres, and introduced the idea of vocal health as it relates to genre.

> I feel classical vocal techniques are best suited if you are trying to preserve your voice…like for [singing for longer years], you don't want it to get damaged from all that singing. If you are using the right techniques, you will sing without risking getting damaged. But when it comes to CCM, for some of the styles you get really caught up in the emotion of it. You might tend to forget some of these techniques and just go with the way the music takes you and you might damage your voice. I would prefer traditional Kenyan (laughs) music to Bel Canto…traditional [singing] has this way where it's natural, but naturally good for your voice.

She also expounded regarding Kenyan popular music, and her own vocal training.

> When it comes to popular music, if I sing it too much, 'cause some of the style calls for a little bit more strain and a little bit more energy, yes, my voice does go a little bit more tired with that than with normal classical music. Personally, I think it's 'cause there's some vocal techniques in popular music that either hasn't been discovered or I haven't learned it yet…Some of the styles that you add to a particular note or particular tune, how it's sung, can't be properly executed in a way that doesn't damage or hurt or harm the voice. When it comes to Kenyan popular music I think that the vocal health issues would be the same as you'd find everywhere else in the world, because it's popular music. Popular music has a characteristic.

Marty also discussed the struggle of singing in CCM genres, saying, "When I'm performing contemporary gospel music, which is quite common in Kenya right now, there's always a sense of trying to use a bit of a pop voice that's, that's to me always sounds like trying to ape somebody

else, okay? But, ah, mostly it doesn't work with my voice because I'm so used to classical singing and [so] contemporary genres, they strain me a little." Albert also discussed the trials that he sometimes faces when singing outside of choral music. "I find that when I'm, when I'm singing in the choir, it's much more comfortable for me since I'm doing a voice part, I'm not doing like a solo or anything. So, it's a bit more comfortable to settle on a certain range as opposed to when I do like a pop song, [which] leads me to belt out, then be very soft at some points…If I go really loud, I get very sore. Yeah and sometimes I feel like I want to vomit or something after a while of singing real loud."

Valerie's vocal health and behavior overview can be found in Figure 4.7. Regarding the traditional singing voice, stated that she is more carefree with their "local stuff" and said,

> For classical/Bel Canto, [I do] lots of proper warm up vocal exercises. For CCM I'd basically just start by singing (laughs). Maybe [start with] a simpler song and then work up to the real work that's needed. But a very formal warm up for the classical stuff."

These interview responses indicate that genre has an impact on these NCC participants, and that like their quantitative data showed, they seem most comfortable when singing the traditional music of Kenya. With CCM genres, participants indicated that there is some strain on the voice, and when singing with a Western classical they seem to use a more formal and systematic approach to vocal technique.

Vocal technique. Vocal technique is rarely taught formally in Kenya. Singing is as natural to young children, adolescents, and adults as speaking and walking, so formal training can be an afterthought even amongst voice majors in university (Andang'o, 2000). Regarding her training in traditional folk singing, Louise shared her story, reiterating the fact that vocal technique was learned by mimicking other singers, and often in settings that were less than ideal

Singer Spotlight: Valerie, Nairobi Chamber Chorus

Valerie indicated that she had not experienced any vocal difficulties. Though she has taught for many years, she has a moderate speaking vocal load throughout the week. She typically sings for 10 hours per week, and finds that while CCM genres are her primary genre that singing in Western classical genres causes her the most fatigue. She usually can sing for 2-3 hours before experiencing vocal fatigue. Valerie drinks 32-64oz. of water a day, though she does consume a moderate amount of caffeine. She is often in smoky environments, which may explain that in the past three years she has experienced hoarseness and occasional neck tension. Table 4.15 shows Valerie's dysphonia scores, which that while she presents no dysphonia when singing, her speaking voice indicates that she may have mild to moderate dysphonia according to her VFI scores. Likewise, her irregularity and GNE scores both indicate potential severe dysphonia in the speaking voice. Valerie became slightly more fatigued as she sang through the genre singing trial, but her fatigue dropped drastically when she sang traditional folk music.

Figure 4.7. Vocal behaviors and health overview of Valerie, NCC member

acoustical environments.

> I started singing when I was super young. I was like eight years old-performing and I would be the soloist, so I would need to be louder than anybody else. I would need to be more energetic than anybody else. And there were no microphones and it was not a hall. It's an open field. And yet, I somehow naturally ... The way I was taught the tunes and the songs, the way you approach the notes, were more similar to classical ways or maybe musical theatre ways approaching them safely that wouldn't damage your vocal cords. It's like how you were taught to sing it, 'cause you hear and then you sing it back. So, the way that person was singing it was using the right techniques. So, [therefore] the way you'd be correct is you had to copy that sound. And I think mostly when it comes to bad

> techniques, it depends on what you heard. Most of the time, I started music learning by ear, so I'd copy what I heard. With other techniques, with other music classes, music classes started later on in life. But I always copied what I heard. So bad technique most of the time came in from hearing it from somewhere, 'cause I'd copied so that I can be exactly as what I heard. So, if that person is using bad technique ...I did. [I learned] the difference of bad technique and good technique (laughs) when I started doing ... having music lessons. (laughs). When I started having proper voice classes is when I was like, 'Oh, wow,' and that was in college.

Regarding teaching vocal technique, Marty stated, "[I teach] posture…and vowel placement. I insist on good posture, I insist on vowel placement. I insist on correct voicing. I insist on good diction…Those are some of the things I try to, to encourage. And I also try to avoid the over singing. I try to make sure that my rehearsals are within a certain limit of time so that I do not overwork them as they practice." Valerie admitted that she feels that teaching vocal technique is a weakness for her, saying, "that is something that I find really difficult, to teach vocal technique. It has actually forced me to pull back a little from voice teaching because of that. I figured I needed to research a little more. I know what I need to do but it's, it's been difficult to... explain it to others. 'Cause it's the voice it's not an instrument. I can't show them- like a piano or flute, 'Do this, don't do that.' So I try my best... to explain to my students how I do it for myself. It's not always a success."

In contrast, Louise was very specific, having learned the Estill vocal technique method. She stated,

> I learned this technique from Estill, where you get them to like isolate the different ... the whatevers that make the sound. Like your vocal cords and your ... the muscles in your

> throat and your posture. So, after I align their posture and get them aware of where their larynx is placed, and then we gradually get to that (isolating what makes the sound). Whether you yawn first or like you imagine a yawn, and then you hit the note or ... if it's a low note, you swallow then you keep your larynx low for low notes. So, you can approach many of those notes without damaging your voice… That's how I teach.

Albert was very candid in reporting that he does not consider himself a vocalist, and that his only formal training comes singing in NCC. The four participants from NCC offer a variety comfort levels regarding vocal technique.

Repertoire selection. When it comes to selecting repertoire for their students, genre and vocal health seemed to be important considerations for members of the Nairobi Chamber Chorus. Marty stated,

> I teach little children, so vocal health is a factor because I want to not make the children sing beyond their range…You don't want them to overuse their voice in the wrong range and then you also don't want them to misuse their voices. So, we try as much as possible to talk to them about vocal health and especially for singing we try to discourage shouting a lot.

Valerie stated, "Capability [is a factor when] choosing appropriate music so that it doesn't cause damage…I have a bunch of students that are just totally incapable of the Western traditional classical style." Louise discussed genre considerations by addressing warm-ups and how she prepares her ensemble for the repertoire that they are about to sing.

> I usually put in vocal technique when I'm doing warmups…My warmups would be suited for something that we're going to do that day or that we're going to perform. So that's usually my first step, I adjust the warmups. There are some warmups that are better suited

> for CCM, depending on what quality you want and there are some warmups that are suited for choral music. Whether it's a piece that requires more attention on diction or phrasing, or if [it is] CCM which requires attention on texture and attention on the uniformity of sound, I change that usually when it comes to warmups. I adjust my warmups to suit the genre.

Repertoire selection is one of the most important considerations in regard to the vocal health of singers, and has a major impact regarding the potential tone production, range, tessitura, implementation of musical effects that may impact the voice.

Teaching and vocal fatigue. Within the Nairobi Chamber Chorus, several participants that were interviewed addressed the concern of vocal fatigue being caused by the daily overuse in the classroom. Albert stated it clearly when he said,

> That's one of the considerations… especially [for myself] being a vocal educator. You talk, you end up talking the whole day, from morning 'til evening, so you need to really just take care of your voice at the same time. Just one of the things I keep advising my kids it's you don't have to shout, you don't have to talk loud. Just for them to take care of their voices and obviously just keeping on hydrating and all that. So, just making sure you're not using your voice in a way which you're not supposed to be using. Obviously, I know working in a system like that, there are points you will raise your voice. And actually, that gets my voice really tired quickly. Like if I have to compete with the small kids- They have a sharp, very high, very sharp, loud and very sharp voices. So, if you're trying to calm them down, five minutes of telling them quiet or keep quiet. It's like a whole workout for four hours for you. So, my voice gets tired really quick so I have to keep taking care of my voice.

Albert also cited concerns with vocal health as it relates to the environment, stating,

> I'm never really sure, if whether it's because of the fumes because most of the time when we travel out, we don't get to have all this dust. That's one of the things about going [abroad] 'cause the time we've come to the States, it's always not the dusty times. It's normally just after winter or when there is no dust. So, I feel like when I travel my voice is at its best, 'cause it's very clear, very... it does, my voice does what I want it to do. When I come here [Nairobi], I get a lot of dryness in most of the time I get irritation on my throat when I'm here. When you come back, like I can do a performance outside Kenya today, then come back two days later and my performance won't be the same. So, I don't know probably we have a lot of pollution and particles in our ecosystem.

Vocal fatigue can be caused by overuse or misuse of the voice as Albert stated, and also because of lack of hydration, or environmental concerns such as excessive dust particles. These factors seem to contribute to the NCC participants. The NCC music educators interviewed all presented with mild to severe indicators of vocal dysphonia. Vocal hygiene, physiology, training, vocal loading, and pathology principles seem to be indicators of the source of their dysphonia.

Festival Singers of Florida. In response to the interview question, the participants of FSOF provided very specific and somewhat technical responses regarding vocal technique as music educators (Table 4.17). There was a lot of consistency between the answers, indicating that there was some level of training that they all had received which provided a foundational understanding of similar principles, concepts, and vocabulary.

Value of singing in multiple genres. Overall, the participants of the Festival Singers of Florida that were interviewed valued singing in multiple genres, though they sometimes expressed concerns over vocal issues arising from singing certain styles. Toby stated, "I think

Table 4.17

Festival Singers of Florida Interview Content Analysis Results

	Theme	Responses
Theme 1	**Musical Considerations**	Leaps, range, stylistic differences, **straight tone**, **register adjustment**, **intonation**, **vibrato**, **natural** approach to folk music, **less breath intensity in CCM**, **breathiness in folk singing**, **less space for CCM and folk**, strident tone, **brightness of tone in CCM and folk**, **belt**, heavier weight to tone, thinner tone, vowel adjustment per genre, rhythmic intensity in CCM and folk, muscular tone, balance of tone in classical
Theme 2	**Vocal Technique**	**Resonance**, **authentic sound**, **breath support**, low and relaxed larynx, **more space in pharynx**, tongue placement, **alignment**, adapting voice per style, good singing, placement of sound, adaptable, "legit" singing, limited range for folk singing, adapting to choral sound regardless of genre, **freedom of tone/voice**, **natural voice**, ratio of tone to air, correct production, **relaxed singing in CCM**, formant, spin, longevity of singing career, flowing sound, **blend in choir**, beauty of sound, **range**, glottal attacks in pop singing, **strain**, **forward placement in CCM and folk**, chest resonance in folk, aggressive, screamy, singing off the breath in folk, sensation, diaphragm, Bernoulli effect, abdominal muscles, tone and air connection, **warming up**, lifted sternum, singing for too long a duration, **hyper-conscious of technique**, buoyant , healthy singing, breathe and relax, vocal rest, lack of effort
Theme 3	**Perception**	**Love of genre overcoming vocal health concerns**, Adele, joy, passion, **connection**, empathy, human connection, emotion, unity, fun, shame from mimicking pop stars, **correct production,** pretend sing in order to avoid unhealthy singing, **perception of voice**, voice as an instrument, genres filtered through a choral lens or being "choral-fied"
Theme 4	**Genre Considerations**	Well-rounded, perspective, versatile, **authentic**, increased skill, adapting voice, empathy, create different sounds, adaptable, less boring, exposure, **Shape note singing**, expanding the mind, not whitewashed, sacrifice healthy singing for authenticity, characteristic sound, **free sound in classical**, **range**, **divisi**, **blend**, **changing and manipulating the voice**, big sound, jubilation call, **natural approach**, strain, Baroque singing strain, strong articulations in gospel

Table 4.17 (Continued)

Theme 5	**Music Educator Perspective**	**Contrasting styles and genres**, **diverse programming**, **vocal health**, discovering voice, changing voice, building habits, **range**, **tessitura**, **sustained pitches**, **divisi**, genre, loud dynamics, **chest voice**, pushing, singing too low, healthy chest voice, **age-appropriate**, **avoid pop or rock**, adapting genres through a choral filter, variety, audience appeal, artificial growl, discomfort in sanctioning unhealthy singing in the care of the director, preference, teaching various genres appropriately, pedagogy, shoulder position, **posture**, scaffold, jargon, repetition, sternum, **alignment**, **breath support,** abdominal muscles, diaphragm, vacuum, transitions between registers, connecting sound to breath, internal space, sensations, buzz, **connecting tone to air**, **modifying vowels**, sacrifice authenticity for healthy singing
Theme 6	**Vocal Health**	Tense, pressure on vocal folds, warming up over time, singing "cold" or without warming up, **inflammation**, tissue damage, ENT visit, **issues with speaking voice**, raised volume, heavy on vocal folds, breathiness, **self-prescribed vocal rest**, straining to sing pop, pop-style vibrato as an ornament, **strain**, falsetto, strenuous singing, blend, strong articulations in gospel, singing unfamiliar music causing strain, playfully singing along, **sustained, loud singing causing issues**, organ-esque, **range**, leaps, oversinging, singing too long a duration

* *Bolded words were common responses*

it builds more well-rounded people and musicians [to sing in many genres]. If you sing and truly understand multiple genres, especially if they're world genres, it helps you gain perspective of the joys and passions of other people, which helps to connect us, and it can potentially bring someone new joy if they discover a genre that they didn't know before that they really love. Samantha agreed, saying, "being asked to then create different sounds I think is kind of interesting vocally as a singer and as an artist to try to do that to be adaptable. That's the point of the music too, like when we were learning so much about, you know, the connections that we have between us in Kenya and why we're doing all these African pieces."

Vocal technique in different genres. The FSOF participants seemed to embrace the diverse technique needed to perform in different styles. Toby stated, "as far as vocal technique goes, I just think it's important to be as versatile and authentic as you can to different genres. So, the more genres you sing, the better you will be at that." Samantha defined some of the differences in vocal technique regarding Western, classical Bel Canto style contrasting to other genres.

> I just think in terms of basic like Bel Canto, be really promoting freedom of voice, natural resonance, formant and spin. But the other genres, it's all about straight tone, and a kind of belt. Dare I say a muscled kind of tone and it's, that's kind of what that style of singing requires, enough of the sound that is expected of that genre. And the only way to produce that is through belting and through using the muscles differently. I'm not an ace with the thyroid or the arytenoid and what's happening exactly in terms of chest and belt and Bel Canto style, but literally, physically if the muscles are working differently.

She went on to describe singing in pop genres,

> Pop [makes me feel more vocally fatigued than other genres]…I think I'm ashamed [that as a] vocal teacher, I know better, but like I try to imitate what they're doing, like a lot of glottal attacks and a lot of just really unhealthy habits that if I'm, I'm listening to pop singers and what they're doing. Like if I just try to mimic them, I can just feel the strain. If I don't know the song that well, and I haven't properly learned it the way I should in a healthy manner, then it's going to strain my voice…Just because I like it, it may not be right for my voice. I might be straining to sing something that… I know its kind of older now, but I like Adele. Like I love Adele songs and I love singing them, but every time

that I noticed I would like jamming out and playing my guitar and singing to Adele, after a while I was like, “oh, my voice is exhausted.”

Samantha, whose vocal health overview and behaviors can be found in Figure 4.8, described her

Singer Spotlight: Samantha, Festival Singers of Florida

Samantha indicated that she had mild concerns regarding her voice. She had been diagnosed twice in the past eight years with benign vocal lesions, or nodules. Similarly, when she is required to use her voice frequently such as for long rehearsals with FSOF or at the start of a new semester, she often experiences high levels of vocal fatigue. Her daily vocal load initially was reported as mild, though she stated that she sings for 35 hours per week. One major issue is that she works in a noisy environment as a music educator. Additionally, Samantha indicated that she yells frequently, and that she often experiences stress. Choral music is her primary genre, and she can rehearse for 4 or more hours without feeling fatigue, but CCM genres tire her our more quickly. Samantha drinks more than 64 oz. of water per day, but she also suffers from allergies and acid reflux which she takes prescribed medicine for. She often takes decongestants. Samantha drinks mild amounts of soda, and consumes a moderate amount of caffeine and alcohol. She often experiences vocal fatigue and sore throats. For the past three years she has experienced not only regular vocal fatigue, but also has trouble projecting her voice, has lost a portion of her vocal range, must use increased effort to sing, and at times has pain when singing, all of which are ongoing symptoms which regularly affect her career. She has seen not only a medical doctor for these concerns, but also sought out a singing voice teacher and has self-medicated as needed. The doctor prescribed vocal rest, seeing a speech-language pathologist (SLP) for voice therapy, and suggested using a microphone in class. Table 4.15 shows Samantha’s scores, which indicate that in her speaking and singing voice she suffers from severe dysphonia. However, Samantha’s acoustical assessment indicate perfect vocal health, and her fatigue levels were low and consistent when singing through the genre sing trial.

Figure 4.8. Vocal behaviors and health overview of Samantha, FSOF member

own voice as a “chill” voice, whereas Jenny described her own voice as a big voice that stands out, especially when trying to sing in certain genres. Regarding singing in CCM genres, she stated, “[CCM] just sits a little bit better for me, but I think that has to do more with range. When we're singing that like CCM style music, we're singing in like multiple, multiple, parts. So, there's two or three alto splits and so, my range is limited and it's in a more comfortable place, so my voice is more comfortable which makes me feel more comfortable to sing in the way that I should.”

Range and vocal tessitura have an impact on Toby as well. When singing traditional folk music and CCM genres, Toby stated,

> I'll pretty much always feel tired after singing [traditional folk music] for a while, but pop, not usually. If I get really into, like the stuff we did in Kenya, like the African styles of music…the first time my voice felt tired today was after Tshosholoza. I was really into it. It might have been a [made an ascending rolled r lip trill jubilation/ululation sound] thing, but I don't think it was, 'cause I was trying not to be too screamy. But yeah, if I get really, really into it, and I just want to make a big sound, and have a lot of fun, I will be singing off the breath. I won't be singing with strong breath support the entire time, and I won't realize it till I'm done, and my voice feels weaker…So with African music, I will hook into the sound a little bit more, and I definitely use more chest resonance, and feel a little bit more action around somewhere between my sternum, and my larynx. I usually feel more activity, ‘cause I'm trying to get that very, like, barrel-chested, like, ‘Ha’ (makes guttural, earthy, deep, resonant grunting sound) kind of a thing. But that's just from having listened to African choirs. I don't want to whitewash it. I guess that would be the main difference. It's more hooky, a little bit more aggressive, with more attack and

> decay for sure. It’s got to be more collapsed, otherwise it doesn't sound like their language to them.

George contrasted Toby’s aggressive tonal approach to traditional folk music and CCM genres. He compared singing genres to a continuum of breath and tone on each end, and compared singing in different genres as different amounts of breath and tone as needed for the genre.

> I guess I kind of think of folk singing being a much more natural approach and inherently accessible to non-trained, ‘trained musicians.’ So, it just has a more organic sound. I mean, less. I'll use vibrato as an example. In folk music, it could be breathier because you know, in Bel Canto you're using your breath efficiently. Whereas in folk it doesn't have to be used as efficiently. It's totally acceptable to have extra breath escaping in the tone, and to have like, you know, the less space in the mouth than you would in [Bel Canto or choral singing]…Both traditional folk music and CCM styles are forward and bright. [In folk and traditional], it's not as much lift in the soft palate. There's not as much space. I mean like almost like a healthy belt. Like a light belt, you know what I mean? So, I don't know if it's easier. And maybe even, on a spectrum, it would be like, you know, as you moved towards musical theater and pop belt, it gets heavier and you know, and [the] African spectrum that would be more on this [breathy] end. Still within the same [continuum]. Like the shades of blue or something…And then even when doing other styles in choral music, it's all filtered through the lens of classical singing- Even to the detriment of the style. That's a personal feeling.

Samantha had a similar feeling regarding singing multiple genres in choir, stating that for her singing in traditional folk styles has a more forward placement as does CCM singing,

> Anytime I'm in a choral setting, [or] African pieces might be in just a choral setting, I think something like that is versus a traditional choral piece we're being asked to do a little bit more kind of forward placed tone. That's the way I would assume that it should be performed and for us to get the kind of, maybe more characteristic sound, if you will. So that, and then comparing to, I don't know what you're saying to pop music or, or gospel or whatever. I think as long as it's under the umbrella of choral music, I feel like it's less, um, less forward and less strenuous to sing. Like the African music pieces today, easier to sing than for me if I were to... I did a gospel choir once and that was challenging vocally.

She compared this to the natural voice used "walking around the house or if I'm singing to my son or something like that. It's a lot gentler, I would think. If I'm not like legit practicing like a solo for church or something like that, it's just a lot gentler, it's probably pretty limited, the range that I sing in. It's probably just a range of an octave at most." Range considerations were often talked about by participants of both ensembles. Blend in choral singing was another cause of vocal fatigue for more than one of the participants interviewed. Regarding this, Jenny stated,

> In choir it's so much about the unit, the unit, and like being one, but we are still individuals who have individual voices and like, sometimes the sacrifice to, to be this, to be this one sound allows students to develop unhealthy habits because they're changing and manipulating something that they don't even know that well themselves. So, I think that sometimes like, we need to return to the individual, in order to have a healthy, a healthy choir and students who can sustain like, longevity in this field.

All four of the FSOF participants agreed that vocal technique and tone production differs when singing different genres, though they each approached them slightly differently. Range, tessitura, blend, tone color, and vocal placement issues were discussed by the FSOF participants.

Vocal technique across genres. Participants interviewed in FSOF held similar beliefs regarding healthy vocal technique across genres. All approached singing, regardless of genre, with a Western classical approach to vocal technique. Samantha stated, "Comparing to classical voice technique] in terms of freedom and beauty of sound, that's what I'm always striving for and what I'm basing my sensations off of and what I should be feeling as a singer. Yeah, that's what I'm, that's what I'm aiming for." Toby was even more specific with the classical vocal techniques that he focuses on, stating,

> So anytime I'm singing any style, the goal is to use good breath support whatever that, you know, that means to you. So that's always connected. I always try and have a decent amount of space in the pharynx. I always try and keep the tongue, you know, low-ish, forward relaxed, unless I'm doing a specific ornament, or vocal turn, or you know, run or whatever, I try and keep my larynx relaxed. Otherwise, I mean, the only way I'm not gonna do that is by manipulating my larynx. Posture does change between, so that wouldn't necessarily be ... I mean, you want to stay aligned.

George went so far as to say, "It doesn't matter what a conductor asks me to do, I'll never do anything that goes past where I feel like I'm doing something healthy. I'll just pretend if I have to… I always take that into account. Like I already have to kind of voice where it's not an aggressive voice. It takes a lot for me to be aggressive with my singing. So, I spend a lot of time being the one who's a little less." Like George, Samantha feels that she has a mild voice. She also consciously adjusts her vocal technique in the interest of vocal health regardless of genre.

Samantha has had vocal issues in the past that she has sought treatment for, including vocal lesions, or nodules. She expounded by saying,

> I think over the years, um, through my age and also the vocal issues I've had, I've now even just consciously or even unconsciously just constantly making things easier on my voice. Knowing that every once in a while, maybe sometimes I'll, I'll just breathe and just relax and not even sing. Also, a lot of … I don't feel like I have to apply as much effort to sing when I'm with a group. So, it's just everything just flows out easier no matter what genre it was that we were singing.

Singer Spotlight: Jenny, Festival Singers of Florida

As a middle school choral director, Jenny reported a surprisingly light vocal load, though she did report that she sings 32 hours per week. All of her responses throughout the questionnaire indicated that Jenny has had no concerns over the status of her voice. Though her primary genre is choral music, it is also the genre that makes her feel more fatigued. She stated that she can rehearse for only 2-3 hours prior to feeling fatigued. Jenny indicted that she does experience stress, which can have an impact on vocal function. She consumed only a little of what will dry her out such as caffeine and alcohol, but she also consumes very little water, drinking less than 16oz. of water per day. She indicated that her voice is worse in the morning, which can be a sign of GERD or LPR. In the month leading up to the study, Jenny had experienced some hoarseness, dryness to the vocal mechanism, and loss of a portion of her vocal range. She has not sought out any additional care for these concerns. Table 4.15 shows that Jenny's scores show complete absence of vocal dysphonia except in the very mild indicator of Factor 1, avoidance of use of the voice. Jenny's singing trial showed no fatigue in any genre, and that her fatigue level went down as she sang. Despite this, Jenny stated throughout her interview that she felt that her voice was too "big" for the choral genre, and that she often felt like she had to hold back in the choral rehearsal in order to blend with others.

Figure 4.9 Vocal behaviors and health overview of Jenny, FSOF member

Yet, despite awareness and adapting of the vocal technique as needed, sometimes emotion takes over, and like Toby stated, vocal health is not the first priority for Jenny. Jenny's vocal health overview and behaviors can be found in Figure 4.9. She said "I think that sometimes I want to be in the moment more than I want to take care of my voice, if that makes sense. I want to, to participate, um and be a part of it as opposed to someone looking in, so even when there are moments that I know that I probably should sit out, I don't."

Vocal fatigue and the speaking voice. Like Albert in NCC, Toby shared his concerns regarding his speaking voice and that daily use within the classroom, and how it affects his singing voice. He also has experienced vocal disorders, and has sought out care. He stated,

> There's a point where I've sung too much, or I haven't sung healthily enough, and then my quality will start going down. But it takes a while to get there, unless I'm talking to a class often. That changes everything. Everything, 'cause my really bad times, I had months where I was not ... my falsetto wouldn't phonate, and, this is the vocal cord inflammation I was talking about before. And it was when I was solo in my classroom, and uh, the ENT that I went to said, because I thought, you know, there's got to be tissue damage, but he said, 'No, it's really just inflammation, and it's because of how you're speaking. You speak at raised volumes, and you're heavy on your cords.' But when I get excited… I get, "Ah." (loudly projects voice). Like, very tense, and so, I'm causing constant pressure on my cords. Having an intern has saved my voice. Because I haven't had that happen in the last year and a half, because I've had someone else that I've been teaching with. So, I've been using it just less, physically less.

Teaching with vocal health in mind. All four participants from FSO shared their input regarding their philosophy of vocal health when it comes to their students, genre selection, and

teaching practices. Jenny stated, “As a middle school teacher. I think there has to be great consideration especially with those students who are beginning to discover their voice, and with students whose voices are changing um, that is a point in time where we can build habits so I, I do take careful consideration to what my kids are singing. What I expose my kids to, it, it's not the wide vast of, the wide vast variety. With [my students] I would rather sacrifice sometimes, authenticity, for good singing and healthy singing.” Samantha also values vocal health over cultural authenticity with her students, stating,

> I guess at the concept of that and to get them to be exposed to more than just one type of music. Like same reason why, I think like they should listen to, to jazz and country and you know-Anything because it's good music out there. It doesn't really matter what it is and, or what genre is as long as it's good... I shy away from those like pop arrangements. Like I think I made my first couple years of teaching, I was like, ‘Oh, I'll do this. The kids are really connected with it.’ But then I realized that yeah, it's never going to sound like the pop version because I'm not, I'm not going to let them sing like a pop star. I guess I have let it affect my choices and not really realized that I have.

George seems to agree, stating,

> But specifically, genres I would stay away from. I mean like I wouldn't do a rock like uh, where the, where the style called for like uh, almost like an artificial growl to the sound and things like that…because I'd never let them do that. So, we just ended up sounding stupid, because you know, if I had them do it stylistically correctly, it wouldn’t be ‘good’. Yeah. I wouldn't feel uncomfortable allowing them to do that to themselves in my care… We'll take Bruckner [as another example]. You don't program Bruckner for your young

voices in your groups, you know? They're not ready. Or Wagner for like middle school. It would hurt. It would hurt and it would not be healthy.

Singer Spotlight: George, Festival Singers of Florida

George's results for dysphonia are shown in Table 4.15. These results indicate no dysphonia with the exception of some moderate indicators within the speaking voice with avoidance of use and physical discomfort. This could directly relate to George's opinion that his voice is not an "aggressive" one, and he could therefore be compensating which may cause fatigue. George has a fairly light vocal load throughout the week, and sings only 20 hours per week. He did not express any concern regarding his voice, though he did state that CCM genres make him feel fatigued faster. He can rehearse for 3-4 hours without feeling hoarse, and his primary genre is choral music. George drinks less than 16oz. of water per day, and consumes moderate amounts of soda and alcohol. He also regularly takes ibuprofen. He frequently wakes with his voice worse in the morning, which may be an indicator of GERD or LPR. Though his symptoms have been mild, they do at times affect his career. George has not sought out medical care, and is seemingly vocally very healthy other than his avoidance of use of the voice and physical discomfort with his speaking voice.

Figure 4.10. Vocal behaviors and health overview of George, FSOF member

Though still conscious of vocal health, Toby had a slightly different approach, stating, "I'm very, very conscious of, we're going to sing healthily, no matter what the style is, but then you know, to stay authentic, I'll let them modify vowels, and you know, stuff like that, so it doesn't sound like they're singing Bel Canto the whole thing, but- As far as using this

mechanism, and maintaining alignment, and stuff like that, I really try and be healthy." Toby's vocal health and behaviors overview can be found in Figure 4.11.

Singer Spotlight: Toby, Festival Singers of Florida

Toby not only carries a heavy vocal load, but he also sings for 22 hours per week. He indicated that he had moderate concerns regarding his voice, and shared that he had sought out care because of these concerns. Despite these concerns, Toby can sing for more than four hours before demonstrating hoarseness, though he did indicate that CCM genres make him feel fatigue faster. Toby consumes a moderate intake of caffeine, soda, and alcohol, but often drinks less than 16oz. of water per day. He works in a noisy environment, and stated that he has to yell frequently. Because of his busy schedule, he often eats late at night, which could be an indicator of why his voice is worse in the morning, a classic symptom of GERD or LPR. Toby has experienced many ongoing issues in the past three years that have impacted his career including reoccurring hoarseness, vocal fatigue, loss of vocal range, trouble singing softly, discomfort when singing along with increased effort to sing, neck tension, and frequently running out of air when singing. Not only has Toby seen a voice teacher for these concerns, but he has also sought out medical care. He was diagnosed with inflammation, and was advised to speak less heavily, less loudly, and less frequently, or in short to decrease his vocal loading. He has also sought care with a speech-language pathologist to help him work through these suggestions. Table 4.15 shows Toby's scores, which surprisingly indicates that while his SVHI score indicated severe dysphonia, all of his other scores indicate perfect vocal health and no sign of dysphonia. His fatigue levels were low and consistent when singing through the genre sing trial, and even got lower as he sang longer, a phenomenon that he spoke about in his interview.

Figure 4.11. Vocal behaviors and health of Toby, FSOF member

The FSOF music teachers interviewed had clear pedagogical approaches to teaching vocal technique within their choirs. Toby stated that he "breaks down pedagogy as best as he knows how to do." The steps that he defined were,

> [In] week one, we're gonna start breaking apart posture with the, you know, like most people do with the one foot under each shoulder…I use as much academic vocabulary as possible, but I absolutely, you know, scaffold it, and explain it thoroughly, and have them use repetition so I'm not talking over their heads, so that they're understanding the academic language of that. So, we talk about the sternum being lifted. We talk about maintaining alignment, your shoulder position, all that stuff, and then when we're going into, uh, then when we talk about breath support, I talk about the abdominal muscles expanding, and then when they expand, it pulls the diaphragm down, and the diaphragm is connected to the bottom of the lungs, and causes them to expand, which causes a vacuum, and that's how the air gets sucked in. We do all of that stuff, and they fully understand it. We just break it down.

Samantha shared a similar breakdown of how she teaches vocal technique, stating "A vocal technique like over the sequence of the year, I would start with posture and then breath support and then you talk about internal like space and just kind of all the fundamentals, like what should be happening mechanically and then sensations, like putting their hand on the chest or versus the sinus cavities. Like where are they feeling the buzz and vowels." George furthered this concept by talking about how this foundation relates to genre.

> The foundation would be the way they get your instrument right. Then get your air movement and then figure out how your tone and air connect. So, like you're putting those two pieces together and then, then you can fine tune the sound that's coming out,

you know? But yeah, I think the foundation would be how the breath and tone connect because that's where all the problems occur, in my opinion, is that relationship. I always think of like it's on a spectrum. As you approach more of the CCM styles, the ratio of tone to air becomes more tone. Whereas in classical I view it as being in complete balance, and then there are some folk styles maybe where it's more breath. On the spectrum, like a breath to tone ratio…To me it's just about how you teach it. I wouldn't pick like all music that was sustained loud and long, but I might pick a piece. I wouldn't pick all musical theater. I also know that if I'm going to pick a musical theater piece, I'm going to teach them how to do it in a way that's not maybe a traditional sound that's maybe…like I talked about the filter. [It's Choral-fied]. And we'll sing a filtered version of, of the style.

Both music teachers from NCC and FSOF shared how they adjust their vocal technique by genre, as well as how they adjusted their teaching pedagogy in relation to genre. For both groups of participants interviewed, range and sustained singing in extremes of the range were more of a factor for vocal health than was genre. Participants from both groups defined CCM genres such as pop music as more problematic for them and/or their students. FSOF music educators named the classical, bel canto approach as a more freeing sound, while the NCC music educators stated that their voices were most free and natural when singing the familiar traditional folk music from their country. Both groups stated that working toward a choral blend regardless of genre brought on vocal fatigue. Participants from FSOF that were interviewed articulated similar pedagogies on how to teach vocal technique to their students. Members from both ensembles shared anecdotes on how teaching and overuse of the speaking voice has had a negative impact on their singing voices. All of the participants interviewed valued singing in multiple genres, though the NCC

music teachers focused more on the skill set that singing in multiple genres provided, and the FSOF music educators mainly focused on the emotional benefits and cross-cultural connections.

CAPE-V Results. After singing for the trial, each of the eight participants interviewed were recorded, and a sample of their running-speech in natural conversation was analyzed using the CAPE-V protocol. This tool is used for clinical auditory-perceptual assessment of the voice, and is used by clinicians to describe the severity of a potential voice problem, and can be used to contribute to the hypothesis regarding anatomic and physiological voice problems. It was not intended to stand alone to assess the voice, but rather as an indicator of the need for further testing. It was used to assess roughness, breathiness, strain, pitch, and loudness as well as provided an overall score from 0 to 100. An expert panel evaluated these recordings, and results were determined using inter-rater reliability (Lange, 2011). The inter-rater reliability was substantial ($\kappa = .94$), with an excellent percent agreement of 94% (McHugh, 2012). In the scale "0" meant no issue and "100" meant severe vocal dysphonia. The scale also has additional anchor points of mild, moderate, and severe deviation. Additionally, each participant interviewed was asked to evaluate their speaking voice after completing the singing trial that evaluated genre fatigue.

NCC. All four of the music teachers interviewed in the NCC population had very low scores for each category, indicating only mild deviance, or indicators of dysphonia (Table 4.18). One participant, Valerie did show some signs of more moderate dysphonia, particularly in regard to loudness or intensity. All four spoke with normal resonance, but the two male participants also demonstrated vocal fry.

Participant Response regarding current level of vocal fatigue. Each of the four participants were asked about the current state of their voice as the first interview question.

Albert who scored a 7/100 with a mild overall deviance stated, “A bit tired but manageable. I could do a concert if called to.” His voice did show moderate signs of strain according to the

Table 4.18

NCC Music Teacher participants interviewed.

	Overall Score	Rough-ness	Breathi-ness	Strain	Pitch	Loudness	Resonance	Additional Features
Albert	7 (MI) C	6 (MI) I	1 (None) C	13 (MI) C	2 (None) C	0 (None) C	Normal	Vocal Fry
Louise	5 (MI) C	0 (None) C	16 (MI/MO) I	2 (None) C	0 (None) C	0 (None) C	Normal	
Marty	4 (None) C	5 (MI) I	1 (None) I	11 (MI) I	0 (None) C	0 (None) I	Normal	Vocal Fry
Valerie	18 (MI/MO) C	0 (None) C	10 (MI) I	1 (None) C	1 (None) C	30 (MO) C	Normal	

Note: MI=Mildly Deviant, MO=Moderately Deviant, C=Consistent, I=Inconsistent

CAPE-V evaluation. Louise had an overall score of 5/100, and showed closer to moderate deviance in her breathiness score. She stated, “My voice is good. Um, it's not too hoarse. Um, it's a little bit spent, because of ... um, just from singing.” This could explain the slight breathy quality detected in her voice. Marty stated, “I've not done a lot of singing, but my voice is actually well rested right now. I've not engaged it much today, so my voice is, is basically not bad, it's good.” Marty’s scores were very low (4/100 overall), but vocal fry was detected in his voice. Of the NCC participants interviewed, Valerie had the highest scores, indicating mild to moderate deviance (18/100 overall, and 30/100 in loudness with an indicator of soft speaking). This coincided with her perceived vocal state, saying, “At this minute, um, a little tired so ... and I'd say a little lower than I normally speak, actually.” There was no other sign of dysphonia in

her voice. None of the participants' CAPE-V or comments indicated that there was any major sign of trauma or dysphonia despite the varying levels of fatigue after singing.

FSOF. All four of the music teachers interviewed in the FSOF had low scores for each category, indicating only mild deviance, or indicators of dysphonia (Table 4.19). Though the scores are still considered mild, they are higher than those of the NCC participants.

Table 4.19

FSOF Music Teacher participants interviewed.

	Overall Score	Rough-ness	Breathi-ness	Strain	Pitch	Loudness	Resonance	Additional Features
Jenny	5 (MI) C	0 (None) C	0 (None) C	0 (None) C	9 (MI) C	0 (None) C	Normal	Low Pitch; Slight hypernasality
Toby	12 (MI) C	8 (MI) I	1 (MI) C	21 (MI-MO) I	13 (MI) C	3 (MI) C	Normal	Vocal Fry
Samantha	12 (MI) C	1 (None) C	20 (MI-MO) I	8 (MI) C	0 (None) C	20 (MI-MO) C	Normal	Low pitch; Reduced intensity; Vocal Fry
George	9 (MI) C	12 (MI) I	1 (None) C	0 (None) C	6 (MI) C	17 (MI-MO) I	Normal	Reduced intensity; Vocal fry

Note: MI=Mildly Deviant, MO=Moderately Deviant, C=Consistent, I=Inconsistent

All four spoke with normal resonance, but the three participants also demonstrated vocal fry. The participant with the lowest scores, Jenny, spoke with slight hypernasality. Both female participants spoke with an abnormally low pitch.

Participant Response regarding current level of vocal fatigue. Each of the four participants were asked about the current state of their voice as the first interview question. Jenny who scored a 5/100 with a mild overall deviance stated, "I would say it's, it's warmed up

definitely, but a little fatigued. Um, it is not the most breathy that I was today, but [it was] a little touch a go based on the repertoire. Um, that it's bringing out like some not clear qualities to it. I think it's good. But tired." The only abnormality detected was a slightly lower than average pitch to her speaking voice and a slight hypernasality. No breathiness was detected using the CAPE-V. Toby showed more signs of abnormality, particularly with regard to strain (21/100). His voice was perceived to have vocal fry. He stated, "It feels a little bit dry in the back, but otherwise it feels okay. Maybe a little bit tired, and um, I don't know this if this is the right word to use, but it- it feels a little bit cool or cold. Just a little bit."

Samantha had mild to moderate scores for breathiness and loudness, with the indication of lower than normal intensity. She stated about her voice in its current state, "Oh, um, it's tired. I'm tired, but fine, good. Like I can talk. It's not like hoarse or anything like that". Like Toby, Samantha also showed some slight abnormality. Both of these participants that scored slightly higher did indicate through the course of their interview that they had sought out treatment for vocal concerns in the past. They both scored within only a mildly deviant range with 12/100, and both displayed vocal fry. George's voice also displayed vocal fry, with him scoring a 9/100 overall. He stated, "Um, yeah, [my voice is] a little, a little worn, like sometimes when I go to initiate speech, like air comes out just a little bit at first." Despite this perception, his voice was not deemed breathy, only quiet.

The speaking voice of all eight participants was deemed healthy overall despite varying self-perceived levels of fatigue. Five of the eight participants did demonstrate vocal fry. This correlated with the fact that music teachers in both ensembles were similarly healthy, with no significant difference between the two groups. Though their motivations may be slightly

different, music educators from both ensembles valued singing in multiple genres, and adjusted their pedagogical approach for themselves and their students in order to sing in a healthy manner.

Research Question 4: What is the effect of genre on vocal fatigue within and between the two ensembles, particularly regarding traditional Kenyan and other African folk music set for choirs, Contemporary Commercial Music (CCM) arranged for choral ensembles, and Western traditional and contemporary choral canon?

To assess fatigue by genre, the Ability to Sing Easily (EASE) (Phyland *et al*., 1999) was used. This 20-question instrument (Appendix E), measured both indicators of pathology (subscale 2, 10 questions) and fatigue (subscale 1, 10 questions), was used for this study, as it was designed to measure fatigue level in the moment, while engaged in a singing task. These scores provided a snapshot of the fatigue-level in the voice, and were not intended to be used for clinical diagnosis of trauma, but rather as an indicator.

Subscales. A baseline score was first established using the 10-questions from subscale 2 which measured pathology. The choirs then warmed up for 10 minutes, and proceeded to sing for three separate blocks based on genre. Between each block, they completed the subscale 1 survey which measured fatigue in the moment. Overall, both choirs sang for 106 minutes (Figure 4.12), with 32 minutes for each genre.

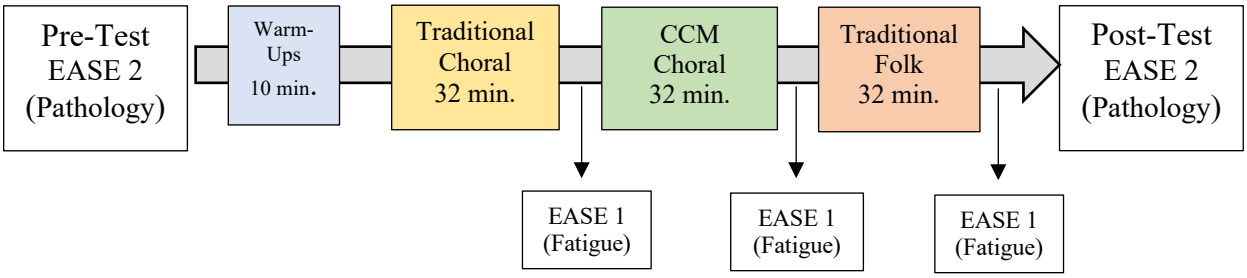

Figure 4.12. Method of Analysis using the Ability to Sing Easily EASE (EASE 2 assesses Pathology and EASE 1 assesses Fatigue)

Genres included traditional and contemporary choral music, CCM music arranged for choirs, and traditional folk music primarily from Kenya or other African countries. This was repeated twice in two separate trials. Results were calculated using the 1st exposure to these genres in the set of rehearsals involved in the study, regardless of day they were exposed.

Criterion-Related Validity. Correlation coefficients between the total scores of the three subscales of the VFI, SVHI, and acoustical baselines (Irregularity and GNE) was already reported in Table 4.6. Additional correlational analysis was performed to also include the EASE subscale 1, or VF (used to determine fatigue in genre) and subscale 2, or PRI (used to assess signs of physiological response in the Pre- and Post-tests. Results are shown in Table 4.20.

Table 4.20
Pearson correlation between dependent variables SVHI, VFI (3 factors), Acoustic (2 Factors- Irregularity & GNE), and EASE 1 & 2 (1st Exposure, 2 Subscales- Fatigue and Pathology)

	VFI1	VFI2	VFI3	SVHI	EASE Pre-	EASE Choir	EASE CCM	EASE Folk	EASE Post-	Irreg.	GNE
VFI1	1										
VFI2	.69***	1									
VFI3	-.42***	-.38***	1								
SVHI	.48***	.45***	.34	1							
EASE Pre-	.31**	.29**	.25	.45***	1						
EASE Choir	.39	.29	.27	.37	.54***	1					
EASE CCM	.28**	.35	.36	.26*	.55***	.61***	1				
EASE Folk	.34***	.23	-.24*	.22*	.47***	.50***	.75***	1			
EASE Post-	.38	.17	.32	.38***	.60***	.61***	.76***	.69***	1		
Irreg.	.27*	.23*	.19	.16	.14	.20	.24*	.18	.17	1	
GNE	- .14	- .16	- .02	- .07	- .12	- .08	- .15	- .11	- .09	-.55***	1

* $p < .05$ (2-tailed), ** $p < .01$ (2-tailed), ***$p < .001$ (2-tailed), Empty cells are non-significant ($p > .05$)

The pre-test EASE subscale 2 (PRI assessment pre-test) is moderately correlated to the dependent variables, ranging between .29 and .60. The post-test EASE subscale 2 (PRI assessment post-test) shows range of correlations ranging from weak ($r = .38$) to strong ($r = .76$),

with the strongest correlation being between the post-test results and the fatigue level after singing the CCM choral music genre. The EASE 1 subscale used to assess fatigue after singing each of the three genres for a 32-minute window. The results of EASE 1 for choral, CCM, and traditional folk were all significantly weak to moderate correlations with the exception of EASE 1 (CCM) to EASE 1 (Traditional Folk). This showed a strong correlation ($r = .75$), indicating that fatigue levels between these two genres are strongly correlated. These findings justify treating these measures as separate measures in subsequent analyses.

EASE Subscale 2 Pre- and Post-Tests. EASE Subscale 2, which measures PRI, or the pathology or mucosal changes that may impair the voice, was used as a pre- and post-test to assess the physiological state of each participant before and after singing the genre blocks. Only the first exposure to the genre singing trial was analyzed for this analysis, meaning that genre order was not accounted for. The dependent variable for this analysis was the SVHI. The between-subjects variable compared the two groups, and the within-subjects variables were the EASE 2 pre- and post-test scores. The results of a Mixed-Design ANOVA showed that there was a significant main effect of choir F (1, 85) = 8.62, $p < .05$, partial *eta* squared $\eta p^2 = 0.092$, on pre- and post-test scores indicating pathology, with overall mean scores for NCC ($M = 10.09$, $SE = .99$) and FSOF ($M = 6.68$, $SE = .60$) performing differently overall. FSOF participants have a significantly lower overall mean score for PRI, or pathology.

There was no significant main effect of pathology (i.e., the repeated-measures, overall pre- and post-test scores). Participants showed similar average recognition scores for pre-test ($M = 8.75$, $SE = .64$) and post-test ($M = 8.02$, $SE = .68$) results. Again, mean scores decreased without a significant difference. There was not a significant main effect on the interaction between overall pre- and post-test scores and choir. Inspection of descriptive statistics revealed

that FSOF participants had lower pre-test scores (M = 7.06, SE = .65) compared to NCC participants (M = 10.44, SE = 1.09); post-test results showed the same pattern (FSOF M = 6.23, SE = .70; NCC M = 9.74, SE = 1.16). Figure 4.13 depicts the same conclusions for both groups showing similar results in their pre- and post-test scores.

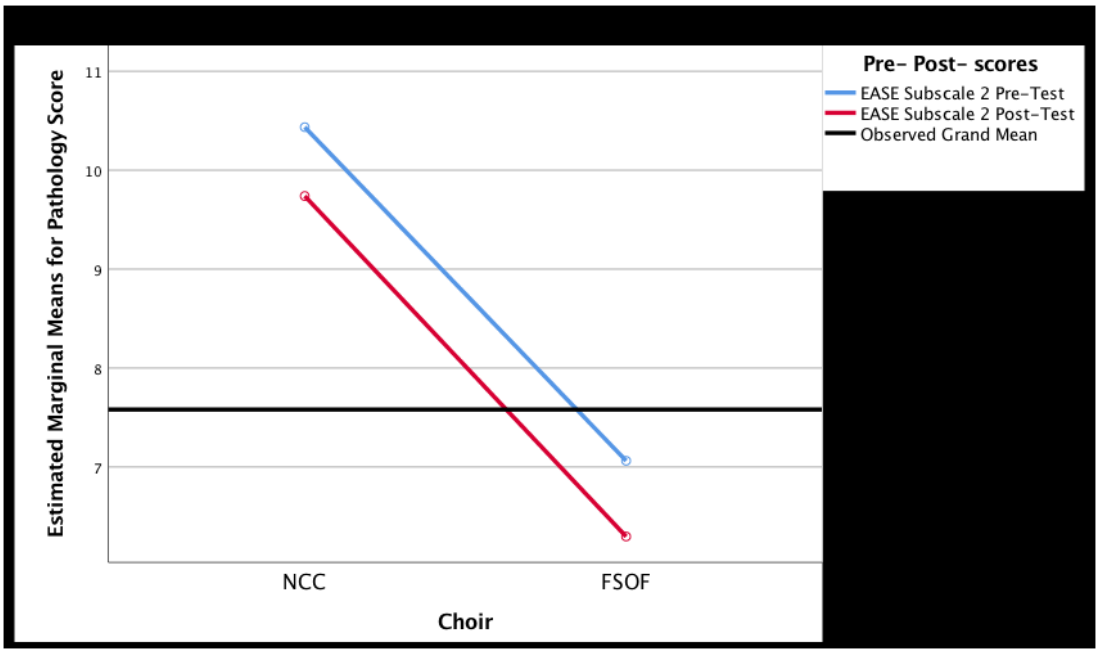

Figure 4.13. Pre- and Post-Test scores of the EASE Subscale 2 measuring pathology before and after singing

These findings suggested that though the mean went down slightly for the entire group and that there was no significant difference between the whole group's pre- and post- tests for the EASE Subset 2 used for the pre- and post-test, measuring pathology or mucosal changes that may impair the voice. In the pre- and post- test results between the groups, NCC participants had significantly higher means for vocal pathology than FSOF participants on both the pre-test and post-test. This suggests that as the treatment conditions proceeded, the vocalists grew less fatigued overall (Table 4.21).

Table 4.21
Mixed Design ANOVA Results of Pre- and Post-Test EASE Results (Pathology)

	M	*SD*	Type III Sum of Squares	*df*	Mean Square	*F*	Sig.	Partial *eta* Squared ηp^2
Within Subjects								
Whole Group Pre-	7.95	.64						
Whole Group Post-	7.21	.68						
Overall Pathology			18.06	85	18.06	1.42	.24	.02
Pre- and Post-Test * Choir			.041	85	.041	.003	.96	.00
Between Subjects								
NCC								
Pre-test	10.43	1.09						
Post-test	9.74	1.12						
FSOF								
Pre-test	7.06	.65						
Post-test	6.30	.70						
Choir			392.85	85	392.85	8.62	.004**	.092

** $p < .01$; ($N = 87$); NCC ($n = 23$); ($n = 64$)

EASE Subscale 1 Genre Fatigue Assessment. EASE Subscale 1 measures vocal fatigue level and is designed to assess the state of each participant during a singing activity. Participants completed the 10-item questionnaire three times regarding their fatigue level after singing repertoire from each specific genre. Participants first sang traditional or contemporary choral music for 32 minutes, then CCM choral music for 32 minutes, followed by folk and traditional choral music, specifically from Kenya or other African countries. A Repeated Measures ANOVA was computed to analyze the fatigue level of the participants after their first exposure to the three genres, regardless of order treatment. All basic assumptions of normality were met with the exception of Mauchly's Test of Sphericity, therefore a Huynh-Feldt correction model was used for the ANOVA.

There was significant interaction between overall fatigue scores and choir (F [1.86, 158.33] = 3.07, $p < .05$, partial *eta* squared $\eta p^2 = .57$). This is a big effect size. Descriptive statistics (Table 4.22) showed that NCC participants' mean scores went up from traditional choral singing to CCM, and then back down for Folk and Traditional (NCC Choral $M = 12.83$, $SE = 1.19$; CCM $M = 14.44$, $SE = 1.29$; Folk $M = 12.65$, $SE = 1.28$). FSOF participants' mean scores went continuously downward (Figure 4.14) from traditional choral singing to CCM, and then Folk and Traditional (NCC Choral $M = 12.27$, $SE = .71$; CCM $M = 10.77$, $SE = .77$; Folk $M = 10.23$, $SE = .77$).

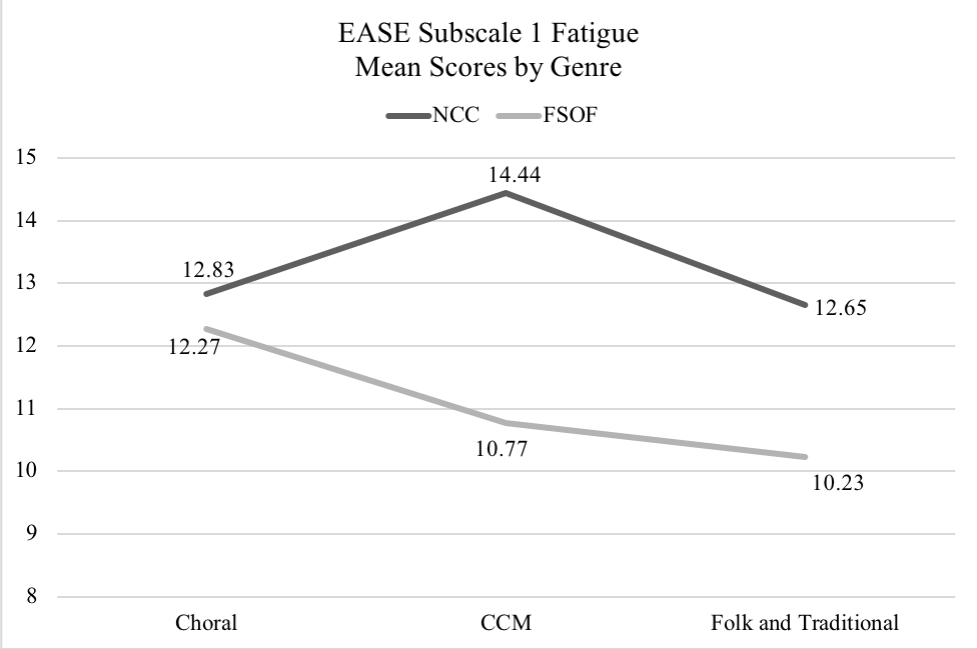

Figure 4.14. Fatigue scores by genre and choir of the EASE Subscale 1 measuring fatigue during singing activities.

A pairwise comparison showed that the significant difference was between CCM and Folk and Traditional genres, where the mean went down from CCM to Folk and Traditional ($\Delta M = 1.16$, $p < .05$). This indicates that NCC's fatigue level between these two genres was significantly different (Table 4.22).

Table 4.22. *Repeated Measures ANOVA Results of Genre 1st Exposure Results (Fatigue)*

	M	*SD*	Type III Sum of Squares	*df*	Mean Square	*F*	Sig.	Partial *eta* Squared ηp^2
Within Subjects								
Whole Group Choral	12.41	5.67						
Whole Group CCM	11.74	6.34						
Whole Group Folk	10.87	6.19						
Genre Fatigue			57.69	1.86	30.97	2.14	.13	.42
Fatigue * Choir			82.79	1.86	44.45	3.07	.05*	.57
Between Subjects								
NCC								
Choral	12.83	5.92						
CCM	14.43	7.25						
Folk and Traditional	12.65*	6.34						
FSOF								
Choral	12.27	5.62						
CCM	10.77	5.73						
Folk and Traditional	10.23	6.06						
Genre Effect on Choir			249.22	85	249.22	3.08	.08	.035

$p < .05$*, ($N = 87$); NCC ($n = 23$); ($n = 64$)

Both groups started the trial by singing music from the Western classical or contemporary choral canon, with very similar means. FSOF participants' fatigue levels went down as they sang through the final two genres, mirroring their EASE 2 pre- and post-test results, though this downward trend was not significant. NCC participants' average fatigue levels went up from 12.83 to 14.43 between choral and CCM, though this increase was non-significant. However, their scores significantly dropped from CCM (14.43) to the traditional folk music (12.65). This is an indication that while these singers have higher fatigue when singing in CCM genres, they have significantly lower fatigue when singing the traditional folk music of their own country. Both NCC and FSOF had lower fatigue levels when singing traditional folk music than when singing Western contemporary or classical choral canon.

Summary

Overall results indicated that participants from both ensembles have a similar understanding regarding the definition of healthy singing, though members of the Nairobi Chamber Chorus focused primarily on concerns regarding range, endurance and avoiding undue strain. Festival Singers of Florida participants focused more on tension free, supported, and resonant singing with emphasis on breath support. Both of these semi-professional choral ensembles considered themselves to be vocally healthy overall with their singing and speaking voices using self-reporting instruments, though the Festival Singers of Florida have lower scores than the Nairobi Chamber Chorus. The Nairobi Chamber Chorus members fell outside of the normal range for Irregularity which measures both jitter and shimmer, though the Festival Singers of Florida were well within the normal range. The GNE scores which measured noise within the speaking voice were in the normal range for both groups, though the Nairobi Chamber Chorus score was the minimum acceptable score within the normal range. The combination of the Singing Voice Handicap Index, the Vocal Fatigue Index, and an acoustical analysis of Irregularity and GNE contributes significantly to an analysis of vocal health, and other factors such as vocal training, physiological aspects, vocal loading, vocal hygiene, genres performed, pathology, and demographics also significantly contributed to determining overall vocal health. In this sample, there was not a significant difference in overall vocal health between music teachers and non-music teachers within each ensemble. Music educators in both choirs highly valued singing in multiple genres and choose repertoire accordingly, and discussed various vocal techniques used when singing across genres. Music educators from NCC sang very differently when using their "natural" voice for traditional folk music and "rounded" singing for choral, CCM, and Bel Canto singing styles. Participants from both ensembles expressed that singing

sustained pitches in extreme ranges and working toward a choral blend was more of a concern than genres sung, though some concern was expressed regarding vocal health when singing in CCM genres. When singing over a period of time, participant pathology and fatigue scores went down, indicating that the more they sang the less fatigued they were. FSOF was significantly less fatigued than NCC participants after 106 minutes of singing. Regarding genre, FSOF fatigue levels decreased with each genre, and NCC participants' fatigue increased when singing CCM choral music, and then significantly decreased when singing traditional folk music from Kenya and other African nations.

Chapter 5: Discussion

Choral musicians and professional voice users rely heavily on their voices being healthy for both their physiological and emotional well-being, and oftentimes for their livelihood. A mixed-methods study was implemented to analyze the overall speaking and singing vocal health of semi-professional choral members from Kenya and the United States. Though their degree of training varied due to systemic differences within their country's educational systems and access to resources for vocal pedagogy, both groups are made up of trained vocalists. Further inquiry was made regarding the level of perceived fatigue of the singing voice after singing each genre for a 32-minute period of time. Finally, perceptions of what it meant to sing in a healthy way were analyzed across some music educators from both ensembles, with an even greater focus on how vocal health was addressed specifically as it related to genre and style. Discussions in response to each research questions set forth for this study are presented hereafter, followed by the limitations, implications, and conclusion of the study.

Research Question One: How do semi-professional choral singers from the United States and Kenya define healthy singing?

When asked "how do you define healthy singing?" participants from both The Nairobi Chamber Chorus (NCC) and the Festival Singers of Florida (FSOF) provided answers that fit into a logical sequential order. Five themes emerged (Figure 5.1): characteristics of healthy singing, physicality of healthy singing, knowledge and training for "proper" use, manifestations of voice issues if singing incorrectly, and musical results of healthy singing. The responses provided by NCC participants primarily focused on what *not* to do within their definitions. They

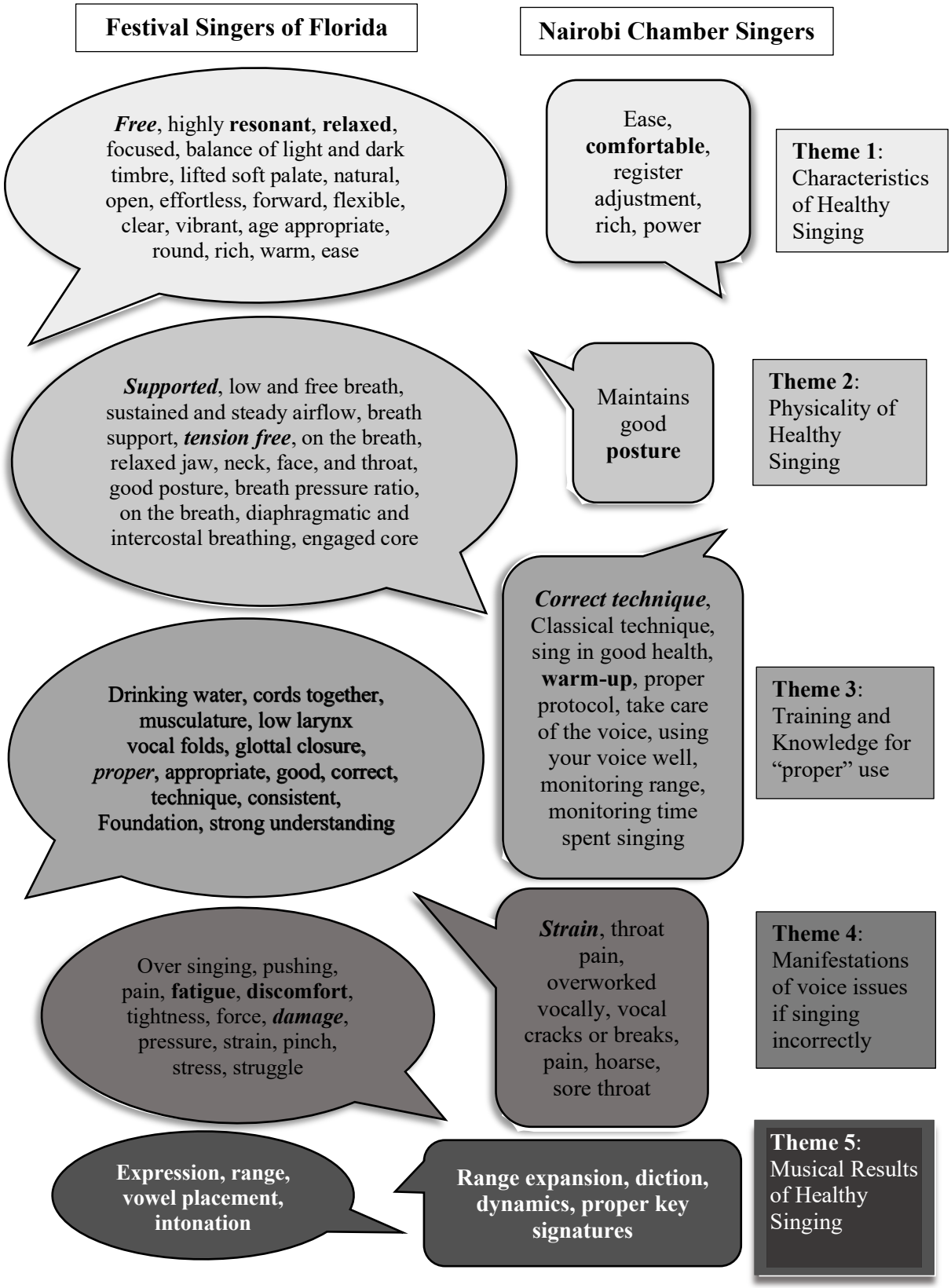

Figure 5.1. Themes and categories of defining healthy singing.

focused primarily on concepts of avoiding strain and singing within a comfortable range and focused on the potential damage if not done properly. Participants from FSOF focused heavily on what to do when defining vocal health. The majority of their answers centered around the physicality of singing, and much of the verbiage used was synonymous with Western vocal technique. There were some commonalities between groups.

Characteristics of Healthy Singing. Both groups described healthy singing as that which is done with ease. The NCC participants commonly spoke of singing comfortably, which the FSOF singers similarly described as effortless singing. These are all tenants of healthy voice function. The NCC participants also spoke of singing with power, as well as navigating register adjustment as characteristics of healthy singing. FSOF singers expounded further, and defined Both groups discussed singing with a rich tone as a characteristic of healthy singing. characteristics such as a free, focused, and resonant tone. The Italian Bel Canto concept of *chiaroscuro* was also named, specifically using the words "balance of light and dark timbres". They described the sound of singing with a lifted soft palate, a forward, flexible, clear, vibrant, age-appropriate tone that is open, round, and warm. They spoke of singing with the "natural" voice, which coincides with singing with ease and effortlessly.

Physicality of Healthy Singing. There was only one commonality between the two groups, and that was the concept of singing with good posture, also named as alignment by the FSOF participants. While the NCC participants only named one physical description within their definition of healthy singing, the FSOF participants expanded upon this concept. They primarily named being tension free and singing with a supported sound, while also discussing low and free breathing, a sustained and steady airflow, breath support, being relaxed in the jaw, neck, face, and throat, demonstrating singing on the breath with appropriate breath pressure ration, and

singing with an engaged core using diaphragmatic and intercostal breathing techniques. The lack of specifics regarding the anatomical and physiological approach to healthy singing by the NCC participants outside of singing with correct posture supports previous findings that more training is needed in this area in Kenyan vocal music education (Andang'o, 2000; Hyslop, 1964).

Training and Knowledge for "Proper" Use. Both groups commonly used the expression, "correct" or "proper" technique, but within that response failed to define what those terms meant and what behavior that entailed. There seemed to be an understanding that these phrases have common meaning that needed no definition. The Nairobi Chamber Chorus members also described this as "classical technique," singing in good health, taking care of the voice, using the voice well, monitoring the range of the music being sung, and monitoring the duration of time singing. NCC participants also regularly spoke of the importance of warming up the voice. Festival Singers of Florida participants spoke of having a strong foundation, singing with appropriate or good technique, being consistent, and singing with the vocal folds closing, or the "cords being together." This was also defined as full glottal closure. They spoke of having a low larynx when singing, use of the musculature within the vocal mechanism, and drinking water, or hydrating to care of the voice. This was the only mention of a commonly understood principle of vocal hygiene. Many of these behaviors are characteristics of vocal technique training in Western classical training and in voice science.

Manifestations of Voice Issues if Singing Incorrectly. Though they used slightly different terminology, members of both groups equally discussed the dangers of over singing or being overworked vocally. They both discussed pain, particularly in the throat if incorrect technique is employed. The most common phrase of the NCC participants was "avoiding strain" on the voice, which was also mentioned by FSOF participants. These participants also discussed

"pushing" the voice, discomfort, tightness, force, pressure, pinch, struggle, or stress on the voice. Several responses discussed vocal fatigue or damage to the voice. NCC participants also discussed avoiding cracks or breaks in the voice, being hoarse, or issues that result in a sore throat. The majority of the responses by the NCC participants were categorized into this theme.

Musical Results of Healthy Singing. When defining healthy singing, the least amount of the responses focused on the results of singing in a healthy manner. Members of both groups talked about range expansion, with participants from NCC focusing heavily on this with their responses. Related to this concept, NCC participants also talked about singing in the proper key for the musicians singing. They also discussed diction and dynamics as musical results of singing in a healthy manner. FSOF participants also discussed expressive singing as a direct result of healthy singing, as well as proper vowel placement and intonation, or singing in tune. While NCC participants primarily focused on the results of singing with poor technique, they also highlighted key components of vocal function. They discussed the importance of warming up the voice, of singing within the framework of a healthy range and tessitura, and of monitoring the duration of time spent singing in order to maintain vocal health. The generalized overview of "correct" or "proper" technique, or even the term "classical" technique used to describe healthy singing could be a result of the lack of clear direction in vocal instruction at universities in Kenya such as Kenyatta University (Andang'o, 2000).

The majority of responses provided by the FSOF participants were descriptors of the physicality of healthy singing or it's characteristics. Because of the high population of music educators within the ensemble and the exposure to vocal pedagogy courses within their training, they have more exposure to concepts and behaviors associated with vocal function, or voice technique. That being said, many of the responses were generalized, or indicated only partial

understanding of the broad field of voice science and the vocal mechanism. At times, incorrect terminology was used to describe the vocal mechanism or how it functions. Traditional singers in the United States with less formal training are unable to universally agree on verbiage to explain vocal qualities (Erickson, 2012), which could be the case with the NCC singers. Both groups focused their responses on Western classical vocal technique principles despite the fact that the NCC members knowledge of these principles may be limited due to the vocal tuition (training) offered in Kenyan universities (Akuno, 2012; Andang'o, 2000).

Research Question 2: What is the overall vocal health of members of the Nairobi Chamber Singers in Kenya and the Festival Singers of Florida in the United States? What is the relationship between overall vocal health as measured by the SVHI, VFI, and an acoustical assessment in in relation to demographics, vocal training, physiology, vocal loading, vocal hygiene, genres performed, and pathology?

The results of the Two-Way MANOVA showed that both ensembles are considered healthy singers in all measures except in irregularity, or the acoustical assessment that combines jitter and shimmer scores. Jitter and shimmer measure the vocal fold vibration and glottic resistance in the vocal folds (Maryn, 2010), or the efficiency of the vocal fold movement with phonation. Participants of the NCC had significantly higher irregularity scores that are considered abnormal (M = 5.53). All other scores were considered normal, though the GNE score (M= .50) for the NCC participants was the lowest acceptable number within the normal range of .5-1.0. The SVHI scores measuring fatigue and pathology of the singing voice and VFI 2 scores measuring the physical discomfort when using the speaking voice were significantly lower for FSOF participants, but they were considered normal for both groups. VFI 1 and VFI 3 subscale scores measuring avoidance of use and improvement with rest (respectively) were not

significantly different between the two groups, and were considered within healthy norms. The combination of the SVHI, VFI, and acoustical analysis had a large effect size relating to vocal health (η_p^2= .62).

Previous literature showed that other variables may impact the overall vocal health of singers such as vocal training, physiology, vocal loading, vocal hygiene, genres performed, pathology, and demographics such as voice classification. When analyzing the impact of these variables, it was found that when controlled for age, sex, and the choir that they participate in, the stated variables significantly account for a large portion of the variance with the SVHI, Irregularity, and GNE scores (66%, 76%, and 55% respectively).

The fact that ΔR^2 = .65 for the SVHI scores using these predictor variables indicates that the singer questionnaire accounts can shed light on aspects that contribute to vocal health. This is especially important given the small sample size. Within this sample, the most important significant predictor for the SVHI score was indicators of pathology, especially excessive dryness (β = .58) and vocal discomfort (β = .56). This supports the literature regarding the importance of hydration as it relates to mucosal wave of the vocal folds (Achey *et al*,, 2016; Behlau & Oliveira, 2009; LeBorgne, 2019; Murry & Rosen, 2000; Timmerman *et al*., 2005).

While those in FSOF have greater access to vocal training, voice training and the training of music educators is seen by some as inadequate in Kenya (Akuno, 2012, Andang'o, 2000) despite the fact that music is a daily part of life within Kenyan culture. Despite these differences, both ensembles are considered vocally healthy overall. Age, sex, and the choir participated in accounted for 57% of the variance of Irregularity. When the additional variables were analyzed in relation to the Irregularity scores, 76% of the variance was explained by the predictor variables, an increase of 28% of the variance of Irregularity explained. The most significant

contributor to this increase was all of the variables in combination with vocal training. Specifically, formal voice training for greater than 20 years (β = .56) had a significant impact on this increase. There is no way to determine the quality of the vocal training within the scope of this study, but the fact that participants studied the voice for that long a period had an impact on their jitter and shimmer as measured with Irregularity. This supports another study where it was found that age, gender, years of teaching, level taught, or vocal health education had no impact on the vocal condition of choral directors, and that these factors were not a predictor of vocal health (Schwartz, 2012).

When measuring GNE, or Glottal-to-Noise Excitation, or breathiness of the voice, age, sex, and their choir designation accounted for 40% of the variance. This was increased to 55% with the predictor variables contributing an additional 15% to the model. Physiology was a significant contributor to the model, with allergies (β = .55), frequent sore throat (β = .63), and stress (β = .42) having the most impact on GNE scores. These are known factors that have an impact on vocal health. Those who suffer from allergies often have a frequent sore throat due to inflammation and post-nasal drip (Roy *et al*., 2004; Simberg, Sala, *et al*. 2009). Stress is known to impact all aspects of health, including vocal function (Achey *et al*., 2016; Behlau & Oliveira, 2009; Murry & Rosen, 2000; Timmerman *et al*., 2005). These effect sizes are quite large, particularly with having a relatively small sample size and a high number of predictor variables. With a larger sample size, these predictor variables may have an even larger effect size, and may significantly contribute to the VFI scores as well.

Measuring the overall vocal health of singers was done using instruments that assessed the singing voice (SVHI), the speaking voice (VFI), and an acoustical analysis of the voice that combined the two (measuring the irregularity and Glottal-to-Noise-Excitation ratio with a

sustained pitch). By measuring all of these aspects using this combination of self-reporting instruments combined with an analysis of vocal fold function through acoustical evaluation, this provides a multiparametric overview of vocal health prior to employing the use of more intrusive examination such a laryngeal videostroboscopic evaluation of the larynx.

Research Question 3: Is there a difference between music teachers and non-music-teachers in each ensemble regarding their overall vocal health? Within the population of music educators from each ensemble, what are the beliefs of vocal health, and vocal training, technique and pedagogy, and repertoire selection as it relates genres performed and the vocal health of their ensembles?

Music teachers typically have a high prevalence toward vocal health issues and dysphonia. Considering that 88% of FSOF participants were music teachers and 40% of NCC participants taught music, the question of the overall vocal health of the music educators within these two groups was raised. As the literature has shown in chapter two, singing teachers have a very high prevalence of vocal disorder in both the United States and abroad. Ninety percent of the music teachers in FSOF teach chorus, and 60% in NCC teach chorus, raising the question of the vocal health of these participants. While there was a significant difference between the two choirs in overall vocal health as previously reported, there was not a significant difference between music teachers and non-music teachers in each ensemble. This surprising result is contrary to other studies within the literature. In order to alleviate vocal fatigue and effort, music educators can teach with less talking during instruction to more consistently engage the active respiratory muscles used in singing (Mattiske *et al*., 1998). It may be due to the training and singing experience of the participants of these two ensembles as they were well trained musicians and sing in high-level ensembles led by well-regarded and skilled conductors.

When interviewing four music educators from each group, six themes emerged: Musical considerations, vocal technique and training, perceptions of the participants, genre considerations, music educator considerations, and vocal health.

Musical Considerations. Concepts such as musical expressivity concepts, range considerations, tone quality and characteristics, and vowels emerged were considered. NCC participants primarily focused on range, singing with loud dynamics, and "rounded" versus "open" vowels, one of the ways they designated singing in using a Western approach versus singing the traditional folk music of their own culture or CCM genres. NCC participants expressed that they sang using rounded vowels when singing Western contemporary or classical choral music or in a classical Bel Canto singing style. When they sang choral arrangements of CCM genres or traditional folk music sung with homophony, they still sang with a slightly rounded vowel approach, though it was more open, or wide as one participant described it. When singing in more traditional settings or informally, they stated that they sang with an open voice. FSOF participants primarily spoke of singing with vibrato versus straight tone, and varying approaches to the musical considerations of singing in different genres. Examples include tone differences in CCM and traditional folk music, with less space being used for resonance and a more forward and bright tone, the use of belting, and the stylistic approach to allowing breathiness into the tone according to the genre.

Vocal Training and Technique. General vocal technique, vocal training, best practices of vocal technique, and common vocal technique issues contributed to this theme. FSOF participants and NCC participants alike spoke of the importance of adjusting vocal technique to the genre being sung, though FSOF participants highlighted more best practices regardless of genre including freedom from tension, supported singing, and the best practices of vocal

pedagogy that are prevalent in Western voice training. Both groups spoke of the challenge of blending in choral ensembles and the strain that it put on their voices and the quest for resonance. Both groups highlighted the issues that cause voice concerns such as singing sustained pitches in extreme ranges, singing loudly for a long period of time, belting, and choral blend. Members of both groups also discussed the importance of warming up the voice prior to singing, though they did not always practice this discipline. NCC participants interviewed spoke about singing with the natural voice, and the fact that their primary way of learning was to model or "ape" other singers or their voice teachers. They stated that if they were modeling someone with poor technique than they would also develop poor technique. One NCC participant did not learn the difference between healthy and poor technique until college. Like in defining vocal health, FSOF participants cited Western classical vocal pedagogy, though again there were some deficiencies in this knowledge with misunderstandings of the vocal mechanism and errors in terminology. They admitted that they were not experts on vocal pedagogy, but did have foundational knowledge on best practices of vocal technique as supported by voice science.

Perception. Self-awareness and the emotional aspects of singing contributed to the participants' perception of singing. While both FSOF and NCC participants discussed the emotional aspects of music-making overcoming vocal technique concerns and the overall effect of the emotion of singing, there were some differences between these groups. Some NCC participants brought up concerns with their own vocal technique, the struggle that they have with teaching vocal technique, aspects of singing to impress rather than for the emotional impact, and their perspective on informal singing. FSOF participants spoke of the love, joy, passion, human connection, increased empathy, and unification of singing in multiple genres while NCC participants primarily spoke of the practical aspects of singing across genres such as increased

skill and the fact that they were capable of doing so. One FSOF member expressed shame from singing with incorrect technique when they knew better in order to mimic a favorite pop star, while another expressed that they disregard the instructions of their conductor if they consider what they were asked to do to be unhealthy.

Genre Considerations. All of the participants interviewed from both groups valued singing in multiple genres. They shared purpose when it related to versatility, increased vocal skills, and authenticity. One participant from each group discussed how Baroque music fatigues their voices more than other genres, and different participants from both ensembles named gospel music as the most fatiguing. Both talked about blending the voice and the implications of that per genre. Authenticity seemed very important to members of FSOF, and they spoke of the need to adapt the voice to create sounds not found in Western classical music and the strain that these sounds could have on their voices. One participant from FSOF spoke specifically about the fact that singing in any of these genres as a choir member filters aspect of these genres through a choral lens, affecting its authenticity and the vocal technique used for that style.

Music Educator Perspective. Though the participants interviewed from both groups appreciated singing in various genres themselves, they were slightly more cautious when it came to programming music for their students. Participants from both groups considered aspects such as range, sustained and repeated pitches, and age-appropriate literature as primary factors when choosing literature for their choirs to sing. While singing in contrasting and varying genres was valued, aspects of certain genres, particularly pop and rock caused some participants in both groups not to program these genres in the quest to avoid damaging the voice. One participant in NCC expressly stated that she programs CCM genres because of student preference and her inability to teach vocal technique effectively, though another explicitly stated how she alters her

teaching practices, warm-ups, and vocal technique according to the genre that she is teaching. NCC participants also expressed that their primary way to teach vocal technique to their students was through correct posture, modeling, and the use of imagery to create an ideal sound. FSOF members gave a systematic approach to their process of teaching vocal technique that focused on alignment or posture, breath intake, breath support, and the concept of connecting the sound to the breath. Several FSOF members stated that they would sacrifice authenticity of style in order to have their student learn to sing in a healthy manner.

Vocal Health. Both FSOF and NCC participants expressed great concern over vocal health issues that have and could arise. The biggest contributor to vocal fatigue from both groups was singing sustained pitches in extreme ranges, particularly if sung loudly. Another factor was singing for long durations, though this seemed to be of greater concern to NCC participants. Members of both NCC and FSOF expressed that they have experienced vocal concerns with physiological or even pathological impact due to the overuse of their speaking voices in the classroom, and discussed how this has impacted their singing voice. The fact that 25% of those interviewed expressed this concern is in line with the literature on the prevalence of voice disorders in teachers, and music teachers specifically. Two members of NCC interviewed spoke of environmental concerns such as frequently singing outside without amplification, the dust in the air, and dryness experienced when singing in Kenya. Two FSOF participants spoke candidly about their past concerns regarding potential vocal issues and how they sought out care to recover from inflammation or nodules. One of those participants spoke about the fact that having an intern in the classroom was helping their voice heal from this inflammation, and both stated that they have changed the way that they use their voices in the classroom after seeking care from a speech and language pathologist. Contrasting this, the NCC member who expressed

concern over vocal fatigue from over use in the classroom also talked about how sometimes high and sustained singing impacts them physically so much that he vomits as a result. They did not mention seeking out medical care for this concern.

While there are many similarities regarding how music educators in these two groups perceive and teach vocal function as well as their opinions regarding singing in varying genres, there are also some key differences. One that particularly stands out is the lack of acknowledgement of the importance of breath intake or breath support by members of the Nairobi Chamber Chorus. In both the open-ended question of defining vocal health and the question regarding vocal technique, there is a significant difference between the importance of breath expressed by Festival Singers of Florida and the complete absence of any discussion of breath by any Nairobi Chamber Singers participant. This factor could be what contributed to the high irregularity scores which measure jitter and shimmer which measures the efficiency of the vocal folds, and the borderline low GNE score which measures noise escaping the glottis within the tone. Both of these factors are related to efficiency of breath and the relationship of subglottal and supraglottal pressure and how that impacts the movement of the vocal folds and the musculature around the vocal mechanism. A factor may be the fact that the Nairobi Chamber Chorus traditionally incorporate movement when they sing, as is traditional in Kenyan Folk Singing. Perhaps this movement allows for their body to have more freedom, ridding them of all tension in their tone. Likewise, the movement may help provide them with innate breath support due to the support and engagement of the core. Perhaps the reason that it is not addressed is because it is typically not an issue due to their continuous movement. This is in contrast to choral singers in the United States who often stay still while singing. Kinesthetic movement in a known

best practice that helps singers have better breath support and is often used in rehearsal to help singers with intonation, freedom of tone, and breath support.

Research Question 4: What is the effect of genre on vocal fatigue within and between the two ensembles, particularly regarding traditional Kenyan and other African folk music set for choirs, Contemporary Commercial Music (CCM) arranged for choral ensembles, and Western traditional and contemporary choral canon?

To assess vocal fatigue by genre, the Ability to Sing Easily, or EASE was administered in two 106-minute singing trial. There were two subscales for this measure, both designed to be done while in the midst of a singing task rather than in a clinical setting using recall. Subscale 2 assesses potential pathology within the voice, and subscale 1 assesses level of vocal fatigue. Baseline scores were first assessed using Subscale 2 which assesses pathology of the voice. This was used as both a pre- and post-test before and after the sing trials. Participants sang for three 32-minute blocks singing different genres per block. Between each block their fatigue level was assessed with the EASE 1 subscale. Pearson's correlation revealed that there were moderate correlations between choir and CCM genres ($r = .61$, $p < .001$), traditional folk music ($r = .50$, $p < .001$), and post-test scores ($r = .61$, $p < .001$). CCM and traditional folk music were strongly correlated ($r = .75$, $p < .001$) as was CCM singing and the post-test ($r = .76$, $p < .001$).

Pre- and Post-Test (Ease 2, Pathology). Vocal fatigue is directly related to vocal loading, and research indicates that the longer one sings, the more fatigued their voice becomes. The results of this study surprisingly showed the opposite, that the longer these participants sang, the less fatigued their voices became. Results of the Mixed-Design ANOVA showed that participants from the Festival Singers of Florida were significantly lower than those in Nairobi Chamber Chorus. Though this was a significant finding, it had a small effect size ($\eta p^2 = 0.09$),

indicating that there is much more that is contributing to these lowered scores. This is contradictory to the literature in regard to vocal fatigue over a long period of singing, though some studies indicate that vocal fatigue does not manifest in trained singers until they have sung for 6-8 hours.

Genre Fatigue (Ease 1, Fatigue). Only the first exposure to these genres was analyzed (regardless of the day of the trial that this first exposure occurred) in the order of choral singing, CCM genres, and traditional folk singing. A Repeated Measures ANOVA showed that there was a significant interaction between fatigue and choir ($p < .05$) with a big effect size ($\eta p^2 = 0.57$). Mean scores were very similar for the baseline of Western choral singing (contemporary or classical) for both groups, but while FSOF singers scores went continuously down with each genre, NCC participants saw a raise in mean scores from choral to CCM, and then a significant drop in mean scores from CCM to traditional folk music. This indicates that NCC singers had more fatigue when singing CCM genres, and then significantly less fatigue when singing the music of their native culture.

This could be related to the use of them using their "natural voice" discussed in the interviews and open-ended question of defining vocal health, or comfort level of singing the music of their culture in using open vowels that were not rounded. In a study that researched the effect of muscular tension in professional versus amateur singers, Koufman and others (1996) found that while professional singers had lower scores and demonstrated less muscular tension when singing their own genre of choice, they had significantly higher scores when singing outside of their own genre. In her interview, NCC participant Valerie's comments mirrored this sentiment.

Limitations

There were limitations of this study. One was the difference in sample sizes between the two ensembles with NCC only having 25 participants and FSOF having 69 participants. Originally there were 128 participants in both groups, but 33 were excluded for missing information. The sample size difference between the two ensembles was innate to the make-up of the groups. The smaller NCC ensemble may try to sing louder than the larger FSOF ensemble to produce more volume because of being a smaller choir. Additionally, the sample size was small, therefore may have affected the power because of the ratio of the number of items being analyzed as compared to sample size. However, these obtained results could encourage future research with a larger sample size.

Another limitation was the potential response to the research environment. Research has indicated that participants who are aware of the behaviors being observed may perform their tasks more efficiently, a phenomenon called the Hawthorne effect (Roethlisberger, 1976). The Hawthorne effect indicates that participants in a study may respond differently if they know about the conditions of the research. Several participants mentioned the fact that knowing the topic influenced their thinking and response to some answers in both the singing trials and their interview responses. Because they knew that vocal fatigue by genre was being studied, it may have impacted some of their responses on the matter.

Within the acoustical evaluation for Irregularity and GNE measures, there was slight difference in the protocol for each choir. Firstly, only 81 of the participants completed the acoustical evaluation due to some participants only attending one of the rehearsal trial dates. While the NCC choirs rehearsed in familiar rooms that they regularly rehearsed in, the rooms or hallway where the acoustical assessment was performed was not soundproof. Because there was

no air conditioning, windows were open in one of the locations, and background noise from outside and in nearby rooms may have interfered with the recordings, though all attempts were made to record in as soundproof a room that was available. The room where the FSOF participants were recorded was extremely quiet with acoustical paneling to dampen any potential ringing of sound that could have interfered with the sound analysis within the software. Despite these potential limitations, the protocol was followed as closely as possible in both conditions, and there were no apparent major issues between the two recording conditions.

The analysis of vocal fatigue by genre had several limitations. Firstly, only the first exposure to the genre was analyzed regardless of day exposed or genre order exposure. Had the original design been followed, the difference in sample size between the two groups would have been too great had order of genre and the day of trial been controlled for as originally planned. Additionally, the rehearsals for the two groups were not at the same time of day due to the bounds of a predetermined rehearsal schedule. The FSOF rehearsals were both in the morning, while both NCC rehearsals were in the evening during the week when most members had been at work all day. Both of these schedules can have a negative impact on the voice, but the fact that they weren't done in the same way poses a limitation to the study. Another limitation was that the FSOF rehearsal trials were sequential and, on the weekend, while the two NCC rehearsals were three days apart, and both on week days.

Lastly, though the 32-minute per genre block types were the same, both ensembles were working on different repertoire. The FSOF ensemble was sightreading through new repertoire while the NCC ensemble was rehearsing music that they had previously learned and performed. Familiarity of the music can have an impact on the confidence and vocal function of the singer. While the classical choral music for each ensemble was more challenging and required more

rigorous attention to vocal technique, both the CCM and traditional folk repertoire performed was less intense and included a lot of sustained singing on neutral syllables which can be sung in an effortless speak-sing voice, or the "natural" voice. Despite these uncontrollable events, as many variables as possible were controlled for successfully per the protocol of the study. Reliability and validity of the data presented are still sound, and the results are deemed to be credible.

Implications

This research has important implications for the future of choral music education, particularly in terms of vocal training techniques across multiple genres of music that include popular musical styles as well as the traditional music of world cultures. Regardless of the genre of music performed, certain aspects of healthy singing are universal, such as diaphragmatic and intercostal breathing, a tension-free posture and singing mechanism, active breath support that allows the vocal folds to vibrate at the ideal rate for each individual, and vocal registration that allows the sympathetic vibrations to resonate for maximum effectiveness while achieving these other goals. This list of universal healthy singing is applicable to teachers of classical, Bel Canto singing, musical theatre singing, and choral music educators. It has been suggested by Ingo Titze (Edwards & Hoch, 2018) that singing styles could now be categorized as acoustic versus amplified rather than genre based in order to relate it more effectively to functional voice training and voice science. Therefore, it has been suggested that curriculum for voice students should include "singing, breathing, posture, articulation, diction, and microphone techniques, interpretation…(and) also the anatomic and functional state of the larynx…and all of the organs which involve the phonation mechanism, and the pneumo-phono-articulation system (nasal and naso-sinusal structures, pharynx, middle and internal ear, auditive tube, and lower respiratory

tract)" (Nacci *et al*., 2019: p. 135). These cornerstones of good teaching can easily transfer to any genre, including the music of our students.

Aesthetic and Scientific Considerations. Vocal health is a well-defined and established construct in the United States and other Western European countries. As the world has gotten smaller with technology, travel, and awareness, these concepts have infiltrated many non-Western countries in their educational and pedagogical practices. Likewise, the vocal practices employed in the music of a place like Kenya have had an impact on music in Western practices. However, the rich cultural traditions in the vocal music of these countries' heritage each have practices and vocal production techniques that are outside the parameters of what is considered "healthy" in classical, Bel Canto singing. Responsibly teaching world music genres would not only allow students to learn more about the diversity of music within the United States and around the world, but would also help prepare them to contribute to our increasingly global environment (Fung, 1995). Tonal biases and varied musical preference may have an impact on our perceptions of culturally and musically diverse music and its' impact on vocal health (Winnie, 2017). Jo Estill (1998) stated that in vocal pedagogy there must be a separation of the "aesthetic judgements of the sound, the music, and the stylistic elements of performance associated with it, some or all of which may be inimical to our ideas of more exalted, classical singing" (p. 43). She directed this concept toward CCM genres, but it can easily be applied to world music genres as well.

This study is merely studying the physiological phenomenon that takes place when singing the music from these and other cultures and genres, however care must be taken to show respect and appreciation of the artistry and beauty of the vocal music outside of Western tradition. As Allsup (2016) stated, "I define music-teacher quality as

> the ability and curiosity to move skillfully and knowingly within and across open and closed domains. I present a music teacher, in other words, who can teach a student to sing into a microphone as willingly and easily as she can teach Bel Canto style" (p. 139). Responsible teaching of these genres using a healthy approach to singing them may allow for vernacular singers not enrolled in a school choir to feel more comfortable joining choir, thereby giving them the enriching experience of singing in an ensemble with its many documented benefits.

This praxial approach can and should inform choral music educators in the United States on the physiological effects of singing in multiple genres using appropriate stylistic and vocal techniques, and how they relate to singing genres such as popular music. The researcher and the audience should be cautious not to allow the bias of Western Classical vocal production to impact the analysis of the study and must be sensitive to the personal and collective feelings involving all participants. Dr. Jun-Qing Lin a vocal scientist who pioneered the study of vocal health in China while seeking to maintain the artistry and culture of traditional Chinese singing (Lin & Pan, 2011) had this to say,

> How to deal with the controversy on vocal correctness? If we take scientific correctness as the only standard, believing that the most highly efficient, most vocally capable and most vocally healthy is the "most correct" method, then to encourage all singing styles to follow the stereotyped patterns toward this "most correct" way, the result will gradually make all different singing styles into one style, gradually suppressing artistic variations. From the perspective of sciences, this may be a plausible solution; however, from the perspective of vocal arts, this would be a terrible loss. Sciences should serve the arts. If we only develop voices according to the demands of "correctness" provided by the

> sciences, although this would enhance the abilities for voice production which leads to healthier vocal organ, we would lose the stylistic features to which consideration must be given. Undeniably, among the schools of high artistic level there are certainly many vocal methods which are even regarded as unhealthy according to scientific analysis. (p. 213)

Students will sing in CCM or traditional styles and genres with or without our guidance. Long before it was known that belting could be taught in a manner that would prevent vocal dysfunction, vocal pedagogue Jo Estill stated (1988),

> However unfortunate the dangers may be, no amount of hand wringing or warnings will stamp out the quality. It is here to stay. What's more, it will probably increase in popularity. In addition to the rock music that dominates teen culture, a large part of American musical heritage – Broadway theater music – is performed with this voice quality…Even now, voice teachers are being asked to teach it and, apparently, there is no substitute. When it is good, it is very, very good and profitable. When it is badly executed, it can be vocally devastating. (p. 37)

Vocal Pedagogy Cross-Training. "Singers in a choral group generally expect the conductor to be an authority on the singing voice, the choral art, and musical fundamentals" (Smith, 2018b, p. 291). Therefore, choral conductors need the proper training to be able to do so. The study of vocal music in diverse settings including diverse cultures, genres, and music should originate from music educators and voice teachers in order to attain healthy and authentic vocal practices, rather than students learning these vocal techniques on their own without guidance (Winnie, 2017). One study showed that 63% of choral singers' gain their knowledge regarding the voice from their choral directors as opposed to a voice teacher (23%) or other methods. It is the choral directors' responsibility to have accurate and up-to-date information to share with

their students. More training in pre-service music education on vocal anatomy and physiology, pedagogy, vocal hygiene, and vocal amplification in the classroom may help to diminish vocal fatigue in choral music educators (Manternach, 2015; Morrow & Connor, 2011a; Morrow & Connor, 2011b; Ravall & Simberg, 2020). Care must be taken to approach genres and styles to ensure not only that it is being sung within the correct parameters of the style, but that it is approached with the correct vocal technique to suit that style.

Expansion of vocal music education. Classical vocal pedagogy has an advantage over CCM vocal pedagogy in the fact that it has a systemized field of vocal pedagogy that has been accepted over time (Potter, 1998). Professional singing teachers have little training or experience in genres other than Western classical vocal technique, or "legit" singing styles though the vocal technique is vastly different (LoVetri & Weekly, 2003; Weekly & LoVetri, 2009). In their study of the training of voice teachers, Weekly and LoVetri (2009) found that while 66% of voice teachers taught in the musical theatre style of vocal production, only 19% of them had any training or experience in that genre, and only 7% of them had training and experience. Formal music education programs have long been exclusionary of popular music (Smith *et al*., 2018).

By expanding vocal music education to include other genres and principles of voice science, vocal musicians will have more training on how to adapt vocal function principles in a healthy way. Much of the literature attributes vocal health to training, which has primarily been in Western classical vocal styles for hundreds of years. Some universities and colleges have begun to offer vocal pedagogy courses and training in CCM and Musical Theatre genres. A continuation of this trend will provide a rich field to continue to study the effects of singing in varying genres. CCM, Musical Theatre, and Pop A Cappella singing requires a different technical approach than Bel Canto singing (Bartlett & Naismith, 2020; Edwards & Hoch, 2018).

CCM and popular music singing styles are considered more demanding on the vocal mechanism because of the duration of singing, intensity, and extended vocal techniques (Edwards, 2014). This was corroborated by the music educators from both FSOF and NCC that were interviewed. Of the eight interviewed, five stated that singing in CCM genres causes them vocal fatigue. The quantitative results of this study showed that CCM mean scores did increase indicating more vocal fatigue, however, the increase was not significant. The NCC singers seemed much more flexible regarding switching vocal technique for CCM genres, while the FSOF music educators staunchly discussed the fact that their vocal technique and that that they teach their students does not change with genre.

The "one-size-fits-all" approach to singing different genres of using the Western classical pedagogical approach in not appropriate, as CCM genres have established technique that is specific to the genre and sub-genres and requires flexibility in voice function that is not as necessary in classical singing (Bartlett, 2014a; Bartlet, 2014b; Hanlon, 2012; LeBorne & Rosenberg, 2014). Choral expert Mary Goetze stated, "It became apparent to me that the attitude of most classical singers is highly Eurocentric and biased with regard to vocal technique, and this shines through in their cautions about vocal health. Some vocal teachers out there are enlightened about belting and teach that technique along with bel canto…I think singing in various ways actually strengthens the mechanism, similar to cross-training in sports, and may contribute to vocal health rather than threaten it." (M. Goetze, personal communication, July 17, 2019).

There has been a significant decline in the music market for performances of classical vocal styles such as opera in favor of CCM genres (Novak-Leonard & Brown, 2011; Meyer & Edwards, 2014). The majority of professional singers globally are in the CCM music industry

(DeSilva, 2016). This decline indicates the great need for higher education institutions and professional organizations to take note and provide the training needed to support the direction of professional vocal music. Very few universities in the United States offer the option to study CCM styles as a voice major (Reinhert, 2019), though popular music styles are now being taught more in K-12 schools (Smith, Dines, & Parkinson, 2017). Without specific training in these genres, who will train these singers in CCM vocal technique in higher music education curriculum? The popularity of these genres anecdotally shows that students are going to sing these genres, with or without our guidance. Higher popular music education (HPME) needs to expand and be developed in order to guide coach, and train popular musician vocalists so that damage does not occur due to incorrect vocal technique for these genres (Bartlett, 2010; Edwards, 2014; LeBorgne & Rosenberg, 2014; LoVetri & Weekly, 2003; Reinhert, 2019).

This same argument could easily be applied to world music pedagogy. An important aspect of World Music Pedagogy is that the performance practices and exploration of diverse musical cultures should honor the music practices and context of that culture (Bartolome, 2019). That extends to vocal technique, especially when anecdotal evidence seems to suggest that singers from varying cultures practice vocal technique contrary to Western classical technique, and are life ling singers. The qualitative data from this study indicates that all four music educators interviewed in NCC talked about using their "natural voice" when performing their traditional music, and the ease with which they sing, yet one FSOF educator interviewed talked about the energy and force needed to produce this vocal style. There is a disconnect, that can be eased with a continuation of training focusing on exploring the appropriate sound with culture bearers present.

Shaw (2012) states that the most important way to ensure cultural validity when programming diverse repertoire is to consult directly with culture bearers, or representatives from the cultures being represented. This is to ensure that it is taught, performed, and even programmed correctly. This concept extends to all genres. If tone production when singing in various world music is a concern for reasons of the vocal health of the ensemble members, what approaches to teaching must take place in order to avoid damaging the singers' voices or even causing vocal fatigue? How does inviting culture bearers and voice teachers to be a part of the rehearsal process can help a choral director navigate this concern (Cash, 2019). The students in the classroom may very well serve as culture bearers at times, which can allow for reciprocal learning, and can fill Paulo Freire's vision of critical pedagogy by continuing to build the on mutual respect, trust, and communication needed between the teacher and student, allowing for them both to learn from the other (Freire, 2000).

Choral pedagogy is an interdisciplinary approach to vocal pedagogy, voice science, and choral conducting. (Smith, 2018b). Choirs traditionally tend to approach all genres with a Eurocentric Western bel canto approach of Western intonation, blend, and tone quality regardless of the vocal technique demonstrated in the vernacular setting. Traditional Western classical vocal pedagogy is often applied to ensemble singing, even when singing in CCM and non-Western ethnic musical styles and genres (Woodruff, 2011). Since the expansion of vocal music education that we have seen since the 1970's to include world music, there is a continued need for teacher training for world musics (Volk, 1993), especially for choral musicians. Vocal timbres vary greatly worldwide, and go beyond this approach. Some cultures utilize a chest register in their music, sometimes the larynx is higher when singing (Goetze, 2000; Goetze, 2017; Sperry & Goetze, 2014). There is evidence that professional, trained singers who perform

using effects such as creaking, grunting, distortion, edge, overdrive, rattle, growl, breathiness, and vocal fry show no sign of voice disorder or vocal dysfunction (Aaen *et al*., 2018; Caffier *et al*., 2018), effects used in both CCM genres as well as in traditional musics of the world, yet choral educators are still concerned about teaching genres that use these techniques.

Like Green (2001) and Folkestad (2006) who believe singing in multiple genres is like two poles of a continuum, Fagnan (2005) states that Bel Canto and Contemporary Vocal Techniques (CVT) correlate and are on a continuum; the adjustment of the vocal tract coupled with the resonators and articulators on one end with the management of breath and airflow on the other. One FSOF participant, George, also addressed the "choral-fied" tone used in choirs as one continuum of breath and tone that shifts according to the genre or style being performed. To accomplish this, choral music educators must understand the foundation of these differences and similarities in these contrasting pedagogical approaches.

Cultural agreement is when the members of a group of people or cultural formation agree on what is pleasant and acceptable to the ear (Blacking, 1973). By putting aside our own pre-conceived perceptions of sound we can come closer to appreciating and understanding musical cultures different from our own (Gibson, 2019). When introducing students to new ways to explore vocal production and educating them on the possibilities within their voices, simultaneously be sensitive to their limitations, easing them into the process by building endurance and facility in order to avoid fatigue or strain (Goetze, 2000, 2017). For example, "the projection style of "shout singing" in Brazilian samba which is used in both the head and chest register is known to produce hoarseness in the voice (Mesquita & Howell, 2019), and Senoga-Zake states that singing in traditional Kenyan folk styles can make a voice hoarse. Further

research includes how to respectfully teach these styles and others like them in a way that avoids this type of damage which can lead to phonotrauma.

Experts agree that approximating the vocal timbres of music sung around the world honors the culture from which the music originates from (Sperry & Goetze, 2014), and allows for a more open approach to Culturally Responsive Pedagogy (Gay, 2000), allowing for singers to incorporate their individual frames of reference, and make learning more relevant for them. This approach is relevant to CCM genres as well as traditional music from the varying cultural backgrounds of singers. Choral music provides opportunity for education to be more culturally responsive by not only teaching about diverse cultures outside of the students' sphere of knowledge, but also validating the students' own cultural background (Shaw, 2012), which likely includes CCM genres. This approach relates back to John Dewey's philosophy of meeting students where they are at, and then building upon their background knowledge in order to maximize intellectual growth.

Singers of all genres need to understand healthy voice function, anatomy and physiology of the voice, vocal hygiene principles, and vocal technique and usage in order to maintain a healthy voice (Ziegler & Johns, 2012). Vocal pedagogue Scott McCoy (2013) stated, "It is time to acknowledge that the world has changed, and that our curricula must be adapted to suit the needs and expectations of the real world, which includes skill in teaching both the classical and CCM genres and techniques" (pp. 181-182). This ideal can also be expanded to include world musics as advocated for with World Music Pedagogy (Bartolome, 2019). One pedagogy expert asked "Does our desire to create in our choirs an 'ideal' tone also create vocal problems for some of our singers? Are we aware of how our traditions may limit the vocal potential of our singers, or even to their development of voice disorders-perhaps after they leave us?" (Thurman, 1983, p.

25). Choral music educators and voice teachers can learn the skill of "cross-training" as described by Edwin (2008, p. 72) as the teaching of pedagogy that helps students explore the entirety of their vocal instrument by training the varied muscle groups needed to sing diverse genres without esthetic bias.

Further Research

Training. More research needs to be done with students who have less training. Most people sing as children and continue into adolescence with little to no training (Smith, 2018b). In many cultures, singing continues on a daily basis throughout the lifetime. This particular study of adult, semi-professional choral singers contrasts with research published that states that in adolescent choral singers, singing musical theatre and gospel genres causes more fatigue than singing classical choral repertoire (Smith-Vaughn *et al*., 2013). Continued study is needed on genre implications on adolescent voices, particularly those who have received vocal "cross-training" in singing in diverse genres. Additional research could address the concept of "nature versus nature" as it relates to vocal health considerations. Are some singers more genetically inclined toward dysphonia no matter how much they are trained? Does being raised or having training using a specific extended vocal technique impact the musculature of the vocal mechanism over time?

Instrument validation and expansion. Implications from this research include validating the combined use of the questionnaire and clinical instruments used for clinical and educational use that can be used to assess vocal health by analyzing the speaking voice, singing voice, and acoustical properties of the voice, which includes assessment of vocal training, physiology, vocal loading, vocal hygiene, genre, and pathology of the voice. There is still room to improve the psychometrics of the measures used. While several of the instruments included

are validated, the combination of the instruments has not yet been documented as a voice-related quality of life instrument.

A similar study with a larger sample size would be beneficial, as well as expanding the parameters to include other countries outside of Kenya and the United States, particularly in regions where indigenous folk singing and other vernacular genres are common. Aside from the measurement of the acoustical analysis of the voice, findings were reliant on the participants' self-reported awareness of the quality of their voice production. Multiparametric measurements which include a physical evaluation of the larynx using laryngeal videostroboscopy and dynamic MRI technology would provide a more comprehensive analysis of the state of the vocal mechanism when singing different genres. More research is needed on the physiological differences in singing different genres and the long-term result on the singers' vocal health using not only self-reporting measures, but also incorporating a comprehensive evaluation by both Speech-Language pathologists and otolaryngologists, implementing strobolaryngoscopy and dynamic MRI evaluations. Research regarding vocal pedagogy should include speaking voice training in addition to vocal hygiene (Sielska-Badurek, *et al*., 2018). Pre-service voice teachers (Nacci *et al*., 2019) nor even singing teachers (Sataloff *et al*., 2012) always recognize signs of pathology such as masses, cysts, nodules, or other signs of laryngeal reflux or edema. While self-reporting measures have proven to be effective, laryngoscopic examinations are more thorough. Multiparametric evaluation of the voice needs to be a priority for future studies that include medical and behavioral history questionnaires, self-reporting measures, acoustical evaluation, laryngeal videostroboscopy, PET, and dynamic MRI technologies for absolute clarity regarding vocal health.

Programming. This study suggests that further research should be done regarding vocal production and pedagogical approaches to sound outside of Western classical vocal concepts as it relates to programming. For choral music educators, programming with range, sustained pitches (especially beyond the tessitura), and varying vocal quality and styles are factors to consider. More research can be done using this study as a foundation regarding these factors rather than the stylistic approach to genre. Additionally, analyzing program order, and how the order of the music impacts vocal fatigue. For example, Jeannette LoVetri advises to consider programming lighter pieces that mainly utilize head voice early in the program, as younger singers with less experience and training in using their head-register-dominant voice will tend to sing flat when using the chest voice (Woodruff, 2011).

Breath and movement. A noticeable difference between FSOF singers and NCC singers was how breathe intake and support were discussed. The majority of FSOF singers mentioned at least one of these concepts when describing healthy vocal technique, yet it was barely mentioned by any member of NCC. More research regarding breath intake and support as it relates to movement in Kenyan culture is needed. Perhaps the reason that breath management is hardly mentioned in Kenya as an integral part of singing in a healthy manner is intrinsically built into their singing without having to name it. As Gibson (2019) describes the South African genre Istibili which connects physical movement with singing, allowing for singers to utilize their lower abdominal muscles and diaphragm in order to support a full, resonant sound; perhaps their continuous shoulder movement prevents them from hunching their shoulders, and naturally creates an open and relaxed posture. These practices are comparable to those in vocal and choral pedagogical best practices where movement rids singers of tension and allows for freedom of breath in the vocal mechanism. Further research needs to be done to not only analyze breath

intake and support in Kenyan singers, but also how breathing metrics and movement affect vocal tone considerations and freedom.

Vocal loading and fatigue. More research needs to be done regarding vocal loading (Phyland, 2017). Findings in this study that singers' fatigue levels decreased as they sing over time could be indicative of what Titze (1994) described regarding increased blood circulation to the laryngeal muscles improving the mobility of the vocal folds and lowered viscosity. This phenomenon was perfectly described in an interview by one FSOF participant, Toby. Though he did not know the results of this study, in his interview, choral music educator described the exact phenomenon of his voice growing less fatigued as he sang and his perception of it. He stated,

> What I've been finding though is that…I did not feel that my answers were very specific to the style or genre. I felt that my answers were getting healthier and healthier as the day went on, 'cause my voice was warming up. I think my voice felt best after the pop stuff, but it wasn't because pop makes my voice feel better, it was because we've been singing for like three hours. And I'm a lower voice, so it usually takes me a couple of hours to really be fully on. Well, I know for lower voice, I mean, my voice teacher in college used to say it is a full, technically, four hours of singing before you are fully doing your best, but she [said] you can get away with two. (laughs) So my voice lessons were at like 8 in the morning. So, she said, 'If you're not waking up at 6 AM, at the very, very latest, and you're vocalizing right away, then you're not going to pass your lesson.' So, I feel I sing better, and better, and better, and better, and better, and then there's a point where I've sung too much, or I haven't sung healthily enough, and then my quality will start going down.

According to his assessment of the situation, his voice quality was increasing as he sang because it would take 2-4 hours for his voice to be fully warmed up. More research is needed in this area. Additionally, more research can be done to discover why these two participant groups have such diverse results regarding vocal loading, and even vocal fatigue as educators. The individual interviews of eight music educators indicated that seven of the eight interviewed exhibited vocal fatigue and dysphonia that correlates with the literature on prevalence of dysphonia in this population. However, the entire groups did not reflect that trend. It is curious that music educators and non-music educators had no significant difference between the two groups.

Best practices. Lastly, further research is needed regarding best practices to teach these diverse genres and styles effectively given the limitation of time. Analysis of successful choral programs that teach Western classical, CCM, and world music genres can help others in creating a spiral curriculum based on scaffolding vocal concepts that can transfer from genre to genre, while not attempting to teach a "one-size-fits-all" approach has been done in the past. It is the voice teacher's responsibility to teach healthy vocal technique to their students, regardless of the style, genre, or cultural origin of the music being rehearsed or performed (Shaw, 2012). Foundational best practices such as posture, breath support, singing within an appropriate vocal range (and tessitura), guarding against vocal tension, limiting usage and avoiding overuse or abuse can be taught to students (Shaw, 2012) regardless of genre being performed. This compares with what Jenny and Toby from FSOF both found and members of NCC stressed repeatedly: that singing in the correct key and a comfortable tessitura makes a difference. Further research on these factors as it relates to all genres including world music and CCM genres will help choral educators to understand how to teach in multiple genres, and if genre is the

consideration or merely the sustained pitches outside of the comfortable singing range is the issue.

In an article revisiting the progress of the *Vision 2020* Housewright Declaration, Clifford Madsen, who wrote the preface to the declaration recently stated, "music educators are trying to expand and include world music and popular music without stopping the teaching of classics in the classroom. But how to you fit is all in?" (Kalogeridis, 2020, p. 29). More research is needed on how to shape this type of curriculum in the interest of continuing to progress the vision set forth in the Yale Symposium, the Tanglewood Symposium, and the *Vision 2020* Housewright declaration. This study indicates that healthy singing can be taught in varying genres and styles, and therefore vocal health should not be a concern for programming in music educators. It is a matter of effective teaching practices to teach singing in multiple genres.

Conclusion

While singing diverse music from varying sources, time periods, and cultures has become acceptable in many choral classrooms and ensembles, genre stigma remains intact particularly as it relates to non-classical genres. Founder of the term "CCM", Jeannette LoVetri stated,

> Stylistic devices that would have 'classical' singers running for cover are contemporary commercial singers' bread-and-butter. We can either pronounce their work as 'all of the devil' or provide technical, physiological, and emotional support to those learning and working within these areas… At first blush, it may appear that the profession of singing requires a singular, Western, classically-oriented pedagogy. However, that perspective has become dubious with the availability of comprehensive, verifiable voice research. (Woodruff, 2011, p. 51)

In both Kenya and the United States, the standards for a quality musical education include singing diverse cultural music as well as styles, and require a musical and vocal approach that are appropriate for the style and honor the music of the culture being performed. This is in line with both CCM vocal pedagogues and World Music Pedagogy. This requires the choral musicians and their educators to develop an understanding of the musical sounds, behaviors, and in the case of WMP, the values of a cultural group. This research in combination with a rich body of voice science literature suggests that trained singers from both Kenya and the United States can sing varied repertoire in CCM, Kenyan, and classical choral genres without causing harm to the voice.

As a keynote speaker of the OAKE National conference (2010), renowned music educator Mary Goetze spoke of her passion of incorporating music of the world into the music classroom. Regarding Eurocentric vocal technique, she stated,

> Vocal timbre is an essential aspect of the songs that we learned – and of any vocal style. I had to re-think my own caveat delivered to teachers at workshops for over 20 years – that singing in any voice other than the head or light register would damage the voice. This I now recognize as ethnocentrism is disguise, and I now want to set the record straight. I now know that the "right" or "light" vocal register of bel canto singing is in fact the "white" voice. Most important, I found that as long as the singers and I followed simple voice conservation practices, approximating an array of vocal timbres did not harm our voices not interfere with the vocal technique of trained singers. When I considered the inherent message, we send to a culture when "we" correct their vocal sound-when we do not respect their way of singing their own songs, I knew that I had to change my tune-and my "tone." (p. 22)

Stated in another way, we cannot deny the "naturalness, complexity, and meaningfulness" of non-Western music, or think of them as inferior (Fung, 1995, p. 36). Winnie (2017) states, "Vocalists should be encouraged to become more versatile in their technique and to perform diverse genres. The vast array of tonal concepts in choral programs propagates a singular aesthetic ideal without understanding of voice science or voice technique" (p 68). Choirs such as Millikin University and Roomful of Teeth, known for their varied approach to tone and technique are inspiration for this type of research on diverse pedagogical approaches to tone. Even Broadway has been impacted by world music and world culture as evidenced by the 2018 Tony award winning musical, *The Band's Visit* as well as *Once on this Island*, which won the 2018 Tony award for best revival of a musical and features non-Western music culture. The global village is shrinking, and musical genres often overlap including in choral repertoire.

This study could help choral music educators navigate repertoire selection, vocal technique considerations, and help to pave the path toward the vision inspired at the Tanglewood Symposium in 1967 and continued in *Vision 2020*. Responsible teaching of multiple genres using a healthy approach to singing them may allow for vernacular singers not enrolled in a school choir to feel more comfortable joining choir, thereby giving them the enriching experience of singing in an ensemble with its many documented benefits. By becoming more relevant and incorporating vocal best practices specific to genre, choral music educators may help ensemble members have a foundation of healthy singing regardless of genre, so that upon graduation they have the ability to make music for life, regardless of genre.

References

Aaen, M., McGlashan, J., & Sadolin, C. (2018). Laryngostroboscopic exploration of rough vocal effects in singing and their statistical recognizability: An anatomical and physiological description and visual recognizability study of distortion, growl, rattle, and grunt using laryngostroboscopic Imaging and Panel Assessment. *Journal of Voice*, *34*(1), 162.e5-162e14.

Abrahams, F. (2017). Critical pedagogy as choral pedagogy. In F. Abrahams & P. Head, P. (Eds.), *The Oxford handbook of choral pedagogy* (pp. 13-30). New York: Oxford University Press.

Abrahams, F. (Ed.). Head, P. D. (2017). *The Oxford handbook of choral pedagogy*. New York: Oxford University Press.

Achey, M. A., He, M. Z., & Akst, L. M. (2016). Vocal hygiene habits and vocal handicap among conservatory students of classical singing. *Journal of Voice*, *30*(2), 192-197.

Adedeji (2005). Hymns – Sacred and secular: Use of poetry in religious literature and in the religious education system of Judeo-Christians and the traditional Yoruba of Africa. *Religion and Society. India 50*(2), 62-78.

Akrofi, E. A. (2002). The teaching of music in Africa. *PROSPECTS- UNESCO*, *4*, 491-504.

Akuno, E. A. (1997). *The use of indigeneous Kenyan children's songs for the development of a primary school music curriculum for Kenya.* [Unpublished Ph.D. thesis]. Kingston University.

Akuno, E. A. (2000). A conceptual framework for research in music and music education within a cultural context. *Bulletin of the Council for Research in Music Education. 18th International Society for Music Education, 147*, 3–8.

Akuno, E. A. (2007). Understanding a national culture through music education: The Kenya experience. *African Musicology Online, 1*(2), 7–21.

Akuno, E. A. (2012). Perceptions and reflections of music teacher education in Kenya. *International Journal of Music Education*, *30*(3), 272-291.

Akuno, E.A. (2015). The singing teacher's role in educating children's abilities, sensibilities and sensitivities. *British Journal of Music Education*, *32*(3), 299-313.

Allsup, R. E. (2016). *Remixing the classroom: Toward an open philosophy of music education.* Bloomington, Indiana: Indiana University Press.

Alves, M., Krüger, E., Pillay, B., Van Lierde, K., Van der Linde, J. (2019). The effect of hydration on voice quality in adults: A systematic review. *Journal of Voice*, *33*(1), 125-e13.

American Academy of Teachers of Singing (AATS). (1986). The pop singer and the voice teacher. *Journal of Voice*, *43*(1), 21.

American Academy of Teachers of Singing (AATS). (2008). In support of contemporary commercial music (non-classical) voice pedagogy. Academy Publications http://www.americanacademyofteachersofsinging.org/ articles/CCMVoicePedagogy.pdf

American Speech-Language-Hearing Association (AHSA) (2002). Consensus Auditory-Perceptual Evaluation of Voice (CAPE-V). https://www.asha.org/uploadedFiles/ASHA/SIG/03/CAPE-V-Procedures-and-Form.pdf

AnalystSoft Inc. (2019, December 31). StatPlus:mac, Version 6. Walnut, CA. Retrieved from http://www.analystsoft.com/en/

Andang'o, E. J. (2000). *Voice tuition: A study of music students' learning experiences, Expectations and performance at Kenyatta University* [Unpublished doctoral dissertation]. Kenyatta University.

Anderson, W. M., & Campbell, P. S. (Eds.). (2010). Teaching music from a multicultural perspective [Special issue]. *Multicultural Perspectives in Music Education, 1*(3).

Appelman, D. R. (1967). *The science of vocal pedagogy: Theory and application* (Vol. 378). Indiana: Indiana University Press.

Askren, K. A. W. (2001). Vocal attrition and vocal educators. (UMI No. 1409080.) [Master's thesis, University of Missouri – Kansas City], *Digital Dissertations Online 40* (06).

Baird, B. J., Mokhtari, T. E., Sung, C. K., & Erickson-DiRenzo, E. (2018). A preliminary study of vocal health among collegiate a cappella singers. *Journal of Voice*. Advance online publication.

Baker, V. D., & Cohen, N. (2017). University vocal training and vocal health of music educators and music therapists. *UPDATE: Applications of Research in Music Education*, *35*(3), 46–54.

Baken, R. J., & Titze, I. R. (2017). Quantitative study of the effects of dehydration on the viscoelastic parameters in the vocal fold mucosa. *Journal of Voice*, *31*(3), A1-A14.

Balog, J. E. (2005). Popular song and music theater: A guide to evaluating music theater singing for the classical teacher. *Journal of Singing-The Official Journal of the National Association of Teachers of Singing*, *61*(4), 401-406.

Banfield, S. (2002). *Stage and screen entertainers in the twentieth century*. In: J. Potter J (Ed.), *The Cambridge companion to singing,* (3rd ed., pp. 63-82). Cambridge, United Kingdom: Cambridge University Press.

Barrett, M.J. (2019). Choral singing in South Africa. In M. Hoch (Ed.), *So you want to sing world music: A guide for performers* (pp. 297-313). Maryland: Rowman & Littlefield.

Bartlett, I. (2014a). More than just style: A profile of professional contemporary gig singers. In S. Harrison & J. O'Bryan (Eds.), *Teaching singing in the 21st* (pp. 367-382). United Kingdom: Springer.

Bartlett, I. (2014b). Reflections on contemporary commercial singing: An insider's perspective. *Voice and Speech Review*, *8*(1), 27-35.

Bartlett, I., Naismith, M. L. (2020). An investigation of contemporary commercial music (CCM) voice pedagogy: A class of its own?. *Journal of Singing*, *76*(3), 273-282.

Bartlett, I., Wilson, P. H. (2017). Working 9–5: Causal relationships between singers' "day jobs" and their performance work, with implications for vocal health. *Journal of Voice*, *31*(2), 243-e27.

Bartolome, S. (2019). Exploring and performing Lithuanian Sutartines. In M. Hoch (Ed.), *So you want to sing world music: A guide for performers* (pp. 215-233). Maryland: Rowman & Littlefield.

Bartolome, S. J., & Campbell, P. S. (2019). *World music pedagogy (Volume V): Choral music education*. New York: Routledge.

Bassich, C. J., & Ludlow, C. L. (1986). The use of perceptual methods by new clinicians for assessing voice quality. *Journal of Speech & Hearing Disorders*, *51*, 125–133.

Baylor Institute of Rehabilitation (n.d.). *Singing voice handicap index.* https://baylorhealth.com/SiteCollectionDocuments/Documents_All%20Saints/BIR%20pages/SVHI%20-%20Singing%20Voice%20Handicap%20Index.pdf

Beeman, S. A. (2017). Perceptions of voice teachers regarding students' vocal behaviors during singing and speaking. *Journal of Voice*, *31*(1), 111-e19.

Behlau, M. (2017). VoxMetria (Version 1.0.7) [Mobile application software]. CTS Informática, Pato Branco, Paraná, Brazil. http://itunes.apple.com

Behlau, M., Madazio, G., Moreti, F., Oliveira, G., dos Santos, L. D. M. A., Paulinelli, B. R., & Junior, E. D. B. C. (2016). Efficiency and cutoff values of self-assessment instruments on the impact of a voice problem. *Journal of Voice*, *30*(4), 506-e9.

Behlau, M., & Oliveira, G. (2009). Vocal hygiene for the voice professional. *Current opinion in otolaryngology & head and neck surgery*, *17*(3), 149-154.

Bennett, P. (1986). A responsibility to young voices. *Music Educators Journal*, *73*(1), 33-38.

Benson, B.E., Baredes, S., Sidor, M.I., Talavera, F., & Kellman, R.M. (2019). Laryngeal manifestations of stroke. https://emedicine.medscape.com/article/867575-overview

Bhavsar, V. (2009). An essay on the evidence base of vocal hygiene. *Journal of Singing*, *65*(3), 285.

Björkner, E. (2008). Musical theater and opera singing—why so different? A study of subglottal pressure, voice source, and formant frequency characteristics. *Journal of Voice*, *22*(5), 533-540.

Blacking, J. (1973). *How musical is man?* Seattle: University of Washington Press.

Bohman, J. (2016). Critical theory. In E.N. Zalta (ed.), *The Stanford encyclopedia of philosophy,* https://plato.stanford.edu/archives/fall2016/entries/critical-theory/.

Borch, D. Z., Sundberg, J., Lindestad, P. Å., & Thalen, M. (2004). Vocal fold vibration and voice source aperiodicity in 'dist'tones: a study of a timbral ornament in rock singing. *Logopedics Phoniatrics Vocology*, *29*(4), 147-153.

Bourne, T., & Garnier, M. (2012). Physiological and acoustic characteristics of the female music theater voice. *The Journal of the Acoustical Society of America*, *131*(2), 1586-1594.

Bourne, T., Garnier, M., & Samson, A. (2016). Physiological and acoustic characteristics of the male music theatre voice. *The Journal of the Acoustical Society of America*, *140*(1), 610-621.

Bourne, T., & Kenny, D. (2016). Vocal qualities in music theater voice: perceptions of expert pedagogues. *Journal of Voice*, *30*(1), 128-e1.

Broaddus-Lawrence P.L., Treole K., McCabe R.B., *et al*. (2000). The effects of preventive vocal hygiene evaluation on the vocal hygiene habits and perceptual vocal characteristics of training singers. *Journal of Voice*, *4*, 58–71.

Brown, J., Thomson, N. (2019). Vocal health for singers: Sustaining a professional singing career. *The Musician's Career Lifespan*, 65-80.

Bullinger, M., Anderson, R., Cella, D., & Aaronson, N. (1993). Developing and evaluating cross-cultural instruments from minimum requirements to optimal models. *Quality of Life Research: An International Journal of Quality of Life Aspects of Treatment, Care & Rehabilitation, 2*, 451–459.

Burns, P. (1986). Acoustical analysis of the underlying voice differences between two groups of professional singers: Opera and country and western. *Laryngeoscope*, 96, 549-554.

Burrack, F. (2009). Growing a new generation of music teachers. *Music Educators Journal, 96*(2), 40–44.

Butlera, A., Lind, V. R., & McCoy, C. L. (2007). Equity and access in music education: Conceptualizing culture as barriers to and supports for music learning. *Music Education Research, 92*(2), 241–253.

Caffier, P. P., Nasr, A. I., Rendon, M. D. M. R., Wienhausen, S., Forbes, E., Seidner, W., & Nawka, T. (2018). Common vocal effects and partial glottal vibration in professional nonclassical singers. *Journal of Voice*, *32*(3), 340-346.

Callaghan, J., Emmons, S., & Popeil, L. (2018). Solo voice pedagogy. In G. McPherson & G. Welch (Eds.), *Vocal, instrumental, and ensemble learning and teaching: An Oxford handbook of music education* (pp. 10). New York: Oxford University Press.

Campbell, P. S. (2002). Music Education in a time of cultural transformation. *Music Educators Journal, 89*(1), 27-33, 54.

Campbell, P. S. (2018). *Music, education, and diversity: Building cultures and communities*. New York: Teachers College Press.

Campbell, P.S., Scott-Kassner, C. (2010). *Music in childhood: From preschool through the elementary grades.* Boston: Schirmer, Cengage Learning.

Carroll, T. L., Nix, J., Hunter, E., Emerich, K., Titze, I. R., & Abaza, M. M. (2005). Objective Measurement of Vocal Fatigue in Classically Trained Singers: A pilot Study. *Otolaryngology-Head and Neck Surgery*, *2*(133), P181.

Cash, S. (2019). Exploring the world through choral music. In M. Hoch (Ed.), *So you want to sing world music: A guide for performers* (pp. 394-406). Maryland: Rowman & Littlefield.

Castelblanco, L. Habib, M. Stein, D.J., de Quadros, A., Cohen, S.M., & Noorrdzij, J.P. (2014). Singing voice handicap and videostrobolaryngoscopy in healthy professional singers. *Journal of voice, 28*(5), 608-613.

Chandler, K. (2014). Teaching popular music styles. In S. Harrison & J. O'Bryan (Eds.) *Teaching singing in the 21st century* (pp. 35-51). United Kingdom: Springer.

Chitguppi, C., Raj, A., Meher, R., & Rathore, P. K. (2019). Is the voice of professional voice users with no vocal cord lesions similar to that of non-professional voice users?. *Journal of Voice*, *33*(1), 66-72.

Choate, R. A., Fowler, C. B., Brown, C. E., $ Wersen, L. G. (1967). The Tanglewood symposium: Music in American society. *Music Educators Journal, 54*(3), 49–80.

Chorus America (2009). *America's performing art: A study of choruses, choral singers, and their impact*. https://www.chorusamerica.org/advocacy-research/americas-performing-art.

Chorus America. (2009). *The chorus impact study: How children, adults, and communities benefit from choruses.* https://www.chorusamerica.org/publications/research-reports/chorus-impact-study

Chorus America (2016). *Chorus operations survey report*. https://www.chorusamerica.org/advocacy-research/chorus-operations-survey-report-2016

Chorus America (2019). The chorus impact study: Singing for a lifetime. https://www.chorusamerica.org/sites/default/files/resources/ChorusImpactStudy_SingingforaLifetime.pdf

Christy, V. (1969). *Foundations in singing*. Iowa: Wm. C. Brown Company Publisher.

Clark, N. (2015). Education in Kenya. *World Education News and Reviews*. http://wenr.wes.org/2015/06/education-kenya

Clarós, P., Porebska, I., Clarós-Pujol, A., Pujol, C., Clarós, A., López-Muñoz, F., & Kaczmarek, K. (2019). Association between the development of pediatric voice disorders and singing in children's choir. *JAMA Otolaryngology–Head & Neck Surgery*, *145*(5), 445-451.

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. *The Annals of Otology, Rhinology & Laryngology, 116*(6), 402-406.

Cohen S.M., Noordzij J.P., & Garrett C.G. *et al*. (2008) Factors associated with perception of singing voice handicap. Otolaryngology. Head Neck Surg. 138, 430–434

Cohen, S. M., Statham, M., Rosen, C. A., & Zullo, T. (2009). Development and validation of the singing voice handicap-10. *The Laryngoscope*, *119*(9), 1864-1869.

Cohen, S. M., Witsell, D. L., & Scearce, L. (2009). The laryngoscope: Treatment responsiveness of the Singing Voice Handicap Index. *Medical Problems of Performing Artists*, *24*(2), 100-101.

Cooper, M. (1970). Vocal suicide in singers. *Music Educators Journal*, *57*(1), 52-54.

Cooper, M. (1996). *Stop committing voice suicide*. Los Angeles, CA: Voice & Speech Company of America.

Cooper, M., & Diehl, C. (1973). *Modern techniques of vocal rehabilitation*. Springfield, IL: Charles C Thomas Pub Ltd.

Creswell, J. W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks, CA: Sage Publications.

Creswell, J.W., & Plano Clark, V.L. (2018). *Designing and conducting mixed methods research*. Los Angeles, CA: Sage Publications.

Critical Theory. (2019). *Dictionary.com*. http:// https://www.dictionary.com/

Cupido, C. (2016). Learning from experience: Exploring the wellbeing of professional opera singers. *Muziki*, *13*(2), 80-107.

Davies, D.G.,& Jahn, A. F. (2004a). Travel and the vocal performer. In: *Care of the professional voice* (pp. 73-77). London, United Kingdom: Butterworth Heinemann.

Davies, D.G., & Jahn, A. F. (2004b). Medications and the professional voice. In: *Care of the professional voice* (pp. 78-87). London, United Kingdom: Butterworth Heinemann.

Decker, H. A., & Herford, J. (Eds.). (1988). *Choral conducting symposium*. Pearson College Division.

Dent, J., El-Serag, H. B., Wallander, M., & Johansson, S. (2005). Epidemiology of gastro-oesophageal reflux disease: a systematic review. *Gut*, *54*(5), 710-717.

De Quadros, A. (2012). *The Cambridge Companion to Choral Music*. London, England: Cambridge University Press.

DeSilva, B. (2016). A survey of the current state of contemporary commercial music (CCM) vocal pedagogy training at the graduate level. [Unpublished doctoral dissertation]. Temple University.

Desjardins, M. (2017). A Systematic Review of Voice Therapy: What effectiveness really implies. *Journal of Voice*, *31*(3), 392-e13.

Dewey, J. (1916). *Democracy and education: An introduction to the philosophy of education*. New York: Macmillan.

Dewey, J. (1934). *Art as experience*. New York: Minton, Balch & Company.

Dewey, J. (1938). *Experience and education*. New York: Macmillan.

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.

Dromey, C., Heaton, E., & Hopkin, J. A. (2011). The acoustic effects of vowel equalization training in singers. *Journal of Voice*, *25*(6), 678-682.

Echternach, M., Popeil, L., Traser, L., Wienhausen, S., & Richter, B. (2014). Vocal tract shapes in different singing functions used in musical theater singing—a pilot study. *Journal of Voice*, *28*(5), 653-e1.

Edwards, M. (2014). *So you want to sing Rock'n'Roll: A guide for professionals* (Vol. 2). Lanham, MD: Rowman & Littlefield Publishers.

Edwards, M. (2015). Vocal damage in CLASSICAL singers: It's not just pop singers that get hurt. *WordPress*. https://edwardsvoice.wordpress.com/2015/08/13/vocal-damage-in-classical-singers-its-not-just-pop-singers-that-get-hurt/

Edwards, M., & Hoch, M. (2018). CCM versus music theater: A comparison. *Journal of Singing*, *75*(2), 183-190.

Edwin, R. (1998). Belting 101: Part two. *Journal of Singing, 55*(2), 61– 62.

Edwin, R. (2007). Belt is legit. *Journal of singing*, *64*(2), 213-215.

Edwin, R. (2013). POP Goes the Classical!. *Journal of Singing*, *69*(3), 331-332.

Eldred, S. (2012). What's the lifespan of a singer's voice? *NBC News*. https://www.nbcnews.com/health/whats-lifespan-singers-voice-1C6436797

Elliott, D. J. (1995). *Music matters: A new philosophy of music education*. New York: Oxford University Press.

Elliott, D.J., Silverman, M. (2015). *Music matters: A philosophy of music education* (2nd ed.). New York, NY: Oxford University Press.

Elpus, K. (2018). Music education promotes lifelong engagement with the arts. *Psychology of Music*, *46*(2), 155-173.

Erickson, M. L. (2012). The traditional/acoustic music project: A study of vocal demands and vocal health. *Journal of Voice*, *26*(5), 664-e7.

Estill, J. (1988). Belting and classic voice quality: Some physiological differences. *Medical problems of performing artists*, *3*(1), 37-43.

Fagnan, L., & Rodet, X. (2003). Acoustical effects of the core principles of the `Bel Canto' method on choral singing. *Royal Institute of Technology Speech, Music, and Hearing - Publications- TRITA TMH*, 443.

Fantini, M., Fussi, F., Crosetti, E., & Succo, G. (2017). Estill Voice Training and voice quality control in contemporary commercial singing: an exploratory study. *Logopedics Phoniatrics Vocology*, *42*(4), 146-152.

Feist, J. (2017, October 13). Famous singers who suffered serious vocal injuries. *ThoughtCo*. https://www.thoughtco.com/singers-who-suffered-serious-vocal-injuries-2455767

Ferretti, D. T., & Latimer Jr, M. E. (2017). A content analysis of ACDA national conference interest sessions: 1960–2013. *The Singing Network*, *1*, 1-25.

Fisher, J., Kayes, G., & Popeil, L. (2019). Pedagogy of different sung genres. In G. Welch, J. Nix, & D.M. Howard (Eds.) *The Oxford Handbook of Singing* (pp. 707-728). London: Oxford University Press.

Florida Vocal Association (FVA). (2019). *MPA Adjudication.* https://fva.net/wp-content/uploads/2011/02/adj_choral_performance_yellow.pdf

Floyd, M. (2001). Individual: Community: Nation a case study in Maasai music and Kenyan education. *International Journal of Music Education, 38*, 13–28.

Floyd, M. (2003a). Modeling music education: Britain and Kenya. *International Journal of Music Education, 40*, 59–80.

Floyd, M. (2003b). Music Makers: Cultural perspectives in textbook development in Kenya, 1985–1995. *British Journal of Music Education, 20*, 291–306.

Folkestad, G. (2006). Formal and informal learning situations or practices vs. formal and informal ways of learning. *British Journal of Music Education* 23(2), 135-136, 143.

Freire, P. (2000). *Pedagogy of the oppressed* (30th anniversary ed.). New York: Continuum.

Fritzell, B. (1996). Voice disorders and occupations. *Logopedics Phoniatrics Vocology*, *21*(1), 7-12.

Fung, C. V. (1995). Rationales for teaching world musics. *Music Educators Journal*, *82*(1), 36-40.

Gänzl, K., Lamb, A. (1988). *Gänzl's book of the musical theatre*. London: The Bodley Head.

García-López, I., Núñez-Batalla, F., Bouzas, J. G., & Górriz-Gil, C. (2010). Validation of the Spanish version of the voice handicap index for vocal singing (SVHI). *Acta Otorrinolaringologica (English Edition)*, *61*(4), 247-254.

García, M. G., & López, J. M. (2017). Voice habits and behaviors: Voice care among Flamenco singers. *Journal of Voice*, *31*(2), 246-e11.

Gay, G. (2000). *Culturally responsive teaching: Theory, research, and practice*. Teachers College Press.

Gibbs, G. R. (2010). Thematic coding and categorizing. *Analyzing qualitative data.* London: SAGE, 38-56. http://search.ebscohost.com.ezproxy.lib.usf.edu/login.aspx?direct=true&db=edsbvb&AN=edsbvb.BV036514292&site=eds-live

Gibson, S.J. (2019). Istibili: Singing and learning South African folk song. In M. Hoch (Ed.), *So you want to sing world music: A guide for performers* (pp. 314-332). Maryland: Rowman & Littlefield.

Gilman, M., Merati, A. L., Klein, A. M., Hapner, E. R., & Johns, M. M. (2009). Performer's attitudes toward seeking health care for voice issues: Understanding the barriers. *Journal of Voice*, *23*(2), 225-228.

Giroux, H.A. (1983). *Theory and resistance in education: A pedagogy for the opposition.* South Hadley, MA: Bergin and Garvey.

Goetze, M. (2000). Challenges of performing diverse cultural music. *Music Educators Journal*, *87*(1), 23.

Goetze, M. (2010). 2010 OAKE National Conference Keynote Address. *Kodaly Envoy*, *36*(4), 20–22.

Goetze, M. (2017). Repertoire as pedagogy: Music of diverse culture. In Abrahams, F. & Head, P. (Eds.) *The Oxford Handbook of Choral Pedagogy.* New York: Oxford University Press, 319-341.

Gotaas, C., Starr, C. D. (1993). Vocal fatigue among teachers. *Folia Phoniatrica et Logopaedica*, *45*(3), 120-129.

Green, L. (2001). *How popular musicians learn: A way ahead for music education*. Aldershot: Ashgate.

Green, L. (2011). The globalization and localization of learning, teaching, and musical identity: Voices across cultures. In L. Green (Ed.), *Learning, teaching, and musical identity: Voices across cultures* (pp. 1–19). Bloomington, Indiana: Indiana University Press.

Gregory, P. (2012). The art of the impossible? A case study and reflections on the experience of art in a rural Kenyan primary school. *International Journal of Art & Design Education*, *31*(3), 265-275.

Gunjawate, D. R., Aithal, V. U., Devadas, U., & Guddattu, V. (2017). Evaluation of singing vocal health in Yakshagana singers. *Journal of Voice*, *31*(2), 253-e13.

Guss, J., Sadoughi, B., Benson, B., & Sulica, L. (2014). Dysphonia in performers: toward a clinical definition of laryngology of the performing voice. *Journal of Voice*, *28*(3), 349-355.

Guzman, M., Barros, M., Espinoza, F., Herrera, A., Parra, D., Muñoz, D., & Lloyd, A. (2013). Laryngoscopic, acoustic, perceptual, and functional assessment of voice in rock singers. *Folia Phoniatrica et Logopaedica*, *65*(5), 248-256.

Guzman, M., Lanas, A., Olavarria, C., Azocar, M. J., Muñoz, D., Madrid, S., ... & Mayerhoff, R. M. (2015). Laryngoscopic and spectral analysis of laryngeal and pharyngeal configuration in non-classical singing styles. *Journal of Voice*, *29*(1), 130-e21.

Hackworth, R. (2009). Vocal hygiene perceptions of experienced and preservice music teachers. *Journal of Music Teacher Education*, *18*(2), 74-88.

Hanlon, S. C. (2012). *Reviewing commercial music resources: A guide for aspiring singers and vocal professionals*. [Unpublished doctoral dissertation]. University of North Texas.

Harrison, S. D., & O'Bryan, J. (Eds.). (2014). *Teaching singing in the 21st Century*. New York: Springer Netherlands.

Hazlett, D.E., Duffy, O.M., & Moorhead, S.A. (2011). Review of the impact of voice training on the vocal quality of professional voice users: Implications for vocal health and recommendations for further research. *Journal of voice, 25*(2), 181-191.

Ho, W. C. (2016). A comparative review of music education in mainland China and the United States: From nationalism to multiculturalism. *The International Education Journal: Comparative Perspectives, 15*(2), 8–57.

Hoch, M. (Ed.). (2018). *So you want to sing CCM (contemporary commercial music): A guide for performers* (Vol. 11). Rowman & Littlefield.

Hoch, M. (Ed.). (2019). *So you want to sing world music: A guide for performers* (Vol. 18). Maryland: Rowman & Littlefield.

Hogikyan ND, & Sethuraman G. (1999). Validation of an instrument to measure voice-related quality of life (V-RQOL). *Journal of Voice*, *13*(4), 557–569.

Hoffer, C.R. (1983). *Teaching music in the secondary schools.* Belmont, California: Wadsworth, Inc.

Holmqvist, S., Santtila, P., Lindström, E., Sala, E., & Simberg, S. (2013). The association between possible stress markers and vocal symptoms. *Journal of Voice*, *27*(6), 787-e1.

Holt, M., & Jordan, J. M. (Eds.). (2008). *The school choral program: Philosophy, planning, organizing, and teaching*. Chicago: GIA Publications.

Hopton-Jones, P. (1995). Introducing the music of East Africa. *Music Educators Journal, 82*(3), 26–30.

Horkheimer, M. (1972). *Critical Theory*, New York: Seabury Press; reprinted Continuum: New York, 1982.

Horton, J. (1974). Some problems of singing in the secondary school. *Music Teacher,* (53)7, 11 - 12

Howard, D.M. (2009). Acoustics of the trained versus untrained singing voice. *Current Opinion in Otolaryngology & Head & Neck Surgery, 17*(3):155-9.

Hunter, E. J., & Banks, R. E. (2017). Gender differences in the reporting of vocal fatigue in teachers as quantified by the vocal fatigue index. *Annals of Otology, Rhinology & Laryngology*, *126*(12), 813-818.

Hyslop, G. (1964). *The prospects for music education in Kenya.* Government of Kenya.

IBM Corp. (2017). IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.

Interkulter (n.d.). *Competition results.* Interkulter World Choir Games. https://www.interkultur.com/results/

Isbell, D. (2005). Music education in rural areas: A few keys to success. *Music Education Journal, 92*(2), 30–34.

Jacobson, B. H., Johnson, A., Grywalski, C., Silbergleit, A., Jacobson, G., Benninger, M. S., & Newman, C. W. (1997). The voice handicap index (VHI) development and validation. *American Journal of Speech-Language Pathology*, *6*(3), 66-70.

Johnson, R. B., Onwuegbuzie, A. J., & Turner, L. A. (2007). Toward a definition of mixed methods research. *Journal of Mixed Methods Research, 1*, 112–133.

Jordan, J., McCarther, S., & Price, K.K. (2017). *The anatomy of tone: Applying voice science to choral ensemble pedagogy*. Chicago: GIA Publications.

Joyce, S., Costello, E. (2019). Irish traditional song: Style, practice, context. In M. Hoch (Ed.), *So you want to sing world music: A guide for performers* (pp. 187-199). Maryland: Rowman & Littlefield.

Kalogeridis, C. (2020), Revisiting the vision. *Teaching Music: A publication of the National Association for Music Education, 27*(3), 26-31.

Kavyu, P. (1975). Problems of continuity in Kenya music education. *Journal of Eastern African Research & Development*, *5*(2), 187-191.

Kayes, G., & Welch. G.F. (2017). Can genre be 'heard' in scale as well as song sasks? An exploratory study of female singing in Western lyric and musical theater styles. *Journal of Voice*, *31*(3), 388e1-388e12.

Kempster, G. B., Gerratt, B. R., Abbott, K. V., Barkmeier-Kraemer, J., & Hillman, R. E. (2009). Consensus auditory-perceptual evaluation of voice: Development of a standardized clinical protocol. *American Journal of Speech-Language Pathology*, *18*(2), 124-132.

Kilonzi, L. A. (1998). Survival of Kenyan music culture within the new development of music education. *Conference Proceedings of the 23rd World Conference of the International Society for Music Education,* 273–281.

Kirsh, E. R. van Leer, E., Phero, H.J., Xie, C., & Khosla, S. (2013). Factors associated with singers' perceptions of choral singing well-being. *Journal of voice, 27*(6), e25-e32.

Klopper, C. (2010). Intercultural musicianship: a collective and participatory form of music exchange across the globe. *Australian Journal of Music Education, 1*, 48.

Knight, M.E. (2019). Exploring folk polyphony through Georgian songs. In M. Hoch (Ed.), *So you want to sing world music: A guide for performers* (pp. 234-260). Maryland: Rowman & Littlefield.

Koufman, J. A., Radomski, T. A., Joharji, G. M., Russell, G. B., & Pillsbury, D. C. (1996). Laryngeal biomechanics of the singing voice. *Otolaryngology—Head and Neck Surgery*, *115*(6), 527-537.

Kraenzel, F. (2017). Motivations and causes of the climax and decline of classical music. *Janus Head*, *16*(1), 39–60.

Kryshtopava, M., Van Lierde, K., Meerschman, I., D'haeseleer, E., Vandemaele, P., Vingerhoets, G., & Claeys, S. (2017). Brain activity during phonation in women with muscle tension dysphonia: an fMRI study. *Journal of Voice*, *31*(6), 675-690.

Kwak, P. E., Stasney, C. R., Hathway, J., Minard, C. G., & Ongkasuwan, J. (2014). Knowledge, experience, and anxieties of young classical singers in training. *Journal of Voice*, *28*(2), 191-195.

Kwok, M., & Eslick, G. D. (2019). The impact of vocal and laryngeal pathologies among professional singers: a meta-analysis. *Journal of Voice*, *33*(1), 58-65.

Ladson-Billings, G. (1995). Toward a theory of culturally relevant pedagogy. *American Educational Research Journal*, *32*(3), 465-491.

Lange R.T. (2011) Inter-rater reliability. In: J.S. Kreutzer, J. DeLuca, B. Caplan (Eds.) Encyclopedia of clinical neuropsychology. Springer, New York, NY

LaPine, P. R. (2008). The relationship between the physical aspects of voice production and optimal vocal health. *Music Educators Journal*, *94*(3), 24-29.

Laukkanen, A. M., Järvinen, K., Artkoski, M., Waaramaa-Mäki-Kulmala, T., Kankare, E., Sippola, S., ... & Salo, A. (2004). Changes in voice and subjective sensations during a 45-min vocal loading test in female subjects with vocal training. *Folia phoniatrica et logopaedica*, *56*(6), 335-346.

LeBorgne, W.D. (2019). Vocal health for singers. In M. Hoch (Ed.), *So you want to sing world music: A guide for performers* (pp. 59-77). Maryland: Rowman & Littlefield.

LeBorgne, W.D. (2018). Vocal health for the CCM singer. In M. Hoch (Ed.), *So you want to sing CCM (Contemporary Commercial Music): A guide for performers* (pp. 51-71). Maryland: Rowman & Littlefield.

LeBorgne, W. D., Lee, L., Stemple, J. C., & Bush, H. (2010). Perceptual findings on the Broadway belt voice. *Journal of Voice*, *24*(6), 678-689.

LeBorgne, W.D., & Rosenberg, M. (2014). *The Vocal Athlete*. San Diego, CA: Plural Publishing, Inc.

Lebowitz, A., & Baken, R. J. (2011). Correlates of the belt voice: a broader examination. *Journal of Voice*, *25*(2), 159-165.

Lee, M., Drinnan, M., & Carding, P. (2005). The reliability and validity of patient self-rating of their own voice quality. *Clinical Otolaryngology*, *30*(4), 357-361.

Leonhard, C., & House, R. W. (1959). *Foundations and principles of music education*. New York: McGraw-Hill Book Company, Inc.

Levine, H.L. (1994). Disorders of singing. In: M.S. Benninger, B.H. Jacobson, A.F. Johnson (Eds.) *Vocal arts medicine: The care and prevention of professional voice disorders* (p. 163). New York: Thieme Medical Publishers.

Lin, J.-Q., & Pan, B.-Y. (Trans.). (2011). Scientific principles of singing chapter 4: Artistic application of the voice. *Psychomusicology: Music, Mind and Brain, 21*, 212–226. http://dx.doi.org/10.1037/h0094013

Lipshutz, J. (2012, August 20). Vocal problems: Why so many artists struggle to stay at full volume. *Billboard Magazine*. https://www.billboard.com/articles/news/480383/vocal-problems-why-so-many-artists-struggle-to-stay-at-full-volume

Lloyd, A. T., Ruddy, B. H., Silverman, E., Lewis, V. M., & Lehman, J. J. (2017). Quantifying laryngopharyngeal reflux in singers: perceptual and objective findings. *BioMed research international*, *2017*.

Lomax, J. A., Lomax, A. (1941). *Our singing country: A second volume of American ballads and love songs*. New York, NY: The Macmillan Company.

LoVetri, J. (2002). Contemporary commercial music: More than one way to use the vocal tract. *Journal of Singing*, *58*(3), 249-252.

LoVetri, J. L. (2003). Female chest voice. *Journal of Singing*, *60*(2), 161-164.

LoVetri J. L. (2008). Contemporary commercial music. *Journal of Voice*, *22*(3), 260–262.

LoVetri, J. L., Lesh, S., & Woo, P. (1999). Preliminary study on the ability of trained singers to control the intrinsic and extrinsic laryngeal musculature. *Journal of Voice*, *13*(2), 219-226.

LoVetri, J. L., & Weekly, E. M. (2003). Contemporary commercial music (CCM) survey: Who's teaching what in nonclassical music. *Journal of Voice*, *17*(2), 207-215.

Madsen, C., (Ed.) (2000). *Vision 2020: The Housewright Symposium on Music Education*. Reston, VA: MENC.

Manternach, J.N. (2015). Voice use and self-reported vocal health of pre-service music educators. *Journal of Music Teacher Education, 24*(3), 53-66.

Mark, M. L., & Gary, C. L. (2007). *A history of American music education* (3rd ed.). Lanham, MD: Rowman & Littlefield Publishers Inc.

Mark, M. M. (1996). *Contemporary music education* (3rd ed.). New York, NY: Schirmer Books.

Maryn, Y. (2010). *Acoustic measurement of overall voice quality in sustained vowels and continuous speech*. Ghent University.

Maryn, Y., & Corthals, P. (2018). Phonanium's Clinical Voice Lab [Computer software]. Lokeren, Belgium. http://www.phonanium.com.

Maryn, Y., Roy, N. (2012). Sustained vowels and running speech in the auditory-perceptual evaluation of dysphonia severity. *Jornal da Sociedade Brasileira de Fonoaudiologia*, 24, 107-112.

Maryn, Y., Roy, N., De Bodt, M., Van Cauwenberge, P., & Corthals, P. (2009). Acoustic measurement of overall voice quality: a meta-analysis. *The Journal of the Acoustical Society of America*, *126*(5), 2619-2634.

Mattiske, J. A., Oates, J. M., & Greenwood, K. M. (1998). Vocal problems among teachers: a review of prevalence, causes, prevention, and treatment. *Journal of voice*, *12*(4), 489-499.

McClaren, P. (2003). *Life in schools: An introduction to critical pedagogy in the foundations of education* (4th ed.). New York, NY: Allyn and Bacon.

McCoy, S. (2018). Singing and voice science. In B. Smith, & M. Hoch (Eds.), *So you want to sing for a lifetime: A guide for performers* (pp. 17-34). Maryland: Rowman & Littlefield.

McCoy, S. (2013). Why I don't teach belting. *Journal of Singing*, *70*(2), 181.

McGlashan, J., Thuesen, M. A., & Sadolin, C. (2017). Overdrive and edge as refiners of "belting"?: an empirical study qualifying and categorizing "belting" based on audio perception, laryngostroboscopic imaging, acoustics, LTAS, and EGG. *Journal of Voice*, *31*(3), 385-e11.

McHenry, M. A., Evans, J., & Powitzky, E. (2016). Effects of bel canto training on acoustic and aerodynamic characteristics of the singing voice. *Journal of Voice*, *30*(2), 198-204.

McHugh, M. L. (2012). Interrater reliability: The kappa statistic. *Biochemia medica: Biochemia medica*, *22*(3), 276-282.

Mesquita, S., Howell, C. (2019). Popular music in Brazil. In M. Hoch (Ed.), *So you want to sing world music: A guide for performers* (pp. 144-186). Maryland: Rowman & Littlefield.

Melton, J. (2007). *Singing in musical theatre: The training of singers and actors*. New York: Allsworth Press.

Meyer, D., & Edwards, M. (2014). The future of collegiate voice pedagogy: SWOT analysis of current practice and implications for the next generation. *Journal of Singing*, *70*(4), 437-444.

Meyerson, M. D. (2003). Greene & Mathieson's the voice and its disorders. *Top Language Disorders, 23*, 68.

Michaelis, D., Gramss, T., & Strube, H. W. (1997). Glottal-to-Noise Excitation Ratio - a New Measure for Describing Pathological Voices. *ACUSTICA*, *4*, 700.

Middendorf, J. H. (2007). Phonotrauma in children: management and treatment. *The ASHA leader*, *12*(15), 14-17.

Miller, D. G. (2000). *Registers in singing: empirical and systematic studies in the theory of the singing voice*. Groningen: University of Groningen,1-240.

Miller, M. K., Verdolini, K. (1995). Frequency and risk factors for voice problems in teachers of singing and control subjects. *Journal of Voice*, *9*(4), 348-362.

Miller, R. (1996). *The Structure of singing.* Belmont, CA: Wadsworth Group/Thomson Learning.

Miller, R. (2004). *Solutions for singers: Tools for performers and teachers.* New York: Oxford University Press.

Mindoti, K. W., & Agak, H. (2004). Political influence on music performance in Kenya between 1963-2002. *Bulletin of the Council for Research in Music Education, 161/162*(Summer-Fall), 155–164.

Mochere, J. (2017). The future of music education in Kenya: Implementation of curriculum and instructional teaching strategies. *Journal of Education and Practice, 8*(6), 1-10.

Moghtader, M., Soltani, M., Mehravar, M., JafarShaterzadehYazdi, M., Dastoorpoor, M., & Moradi, N. (2019). The relationship between Vocal Fatigue Index and Voice Handicap Index in university professors with and without voice complaint. *Journal of Voice*, In press.

Morrow, S. L., & Connor, N. P. (2011a). Comparison of voice-use profiles between elementary classroom and music teachers. *Journal of Voice*, *25*(3), 367-372.

Morrow, S. L., & Connor, N. P. (2011b). Voice amplification as a means of reducing vocal load for elementary music teachers. *Journal of voice*, *25*(4), 441-446.

Morse, J. M. (1991). Approaches to qualitative-quantitative methodological triangulation. *Nursing Research, 40*(3), 120-123.

Murry, T., & Rosen, C. A. (2000). Vocal education for the professional voice user and singer. *Otolaryngologic Clinics of North America*, *33*(5), 967-981.

Murry, T., Zschommler, A., & Prokop, J. (2009). Voice handicap in singers. *Journal of Voice*, *23*(3), 376-379.

Mwangi, S. (2000). *Availability and utilization of instructional resources for the teaching of music in selected primary teachers' training colleges in Kenya* [Unpublished master's thesis]. Kenyatta University, Kenya.

Nacci, A., Baracca, G., Romeo, S. O., Cavaliere, M. D., Barillari, M. R., Berrettini, S., ... & Fattori, B. (2019). Endoscopic and phoniatric evaluation in singing students. *Journal of Voice*, *33*(2), 135-142.

Naismith, M. (2019). A class of its own: Towards a pedagogical framework for singers of contemporary commercial music (CCM). [Unpublished doctoral dissertation]. Queensland Conservatorium, Griffith University.

Nanjundeswaran, C., Jacobson, B., Gartner-Schmidt, J., & Verdolini Abbott, K. (2015). Vocal Fatigue Index (VFI): Development and validation. *Journal of Voice, 29* (4), 433-440.

Napoles, J., Babb, S. Reames, R., Garrett, M.L., & Bowers, J. (2012). On the voice: Beautiful singing with developmental choirs. *The Choral Journal*, *53*(3), 55.

National Association for Music Education (NAfME). (2014). *Standards*. https://nafme.org/my-classroom/standards/

National Association for Music Education (NAfME). (2019). *National Music Adjudication Coalition Concert Choir Assessment form.* https://nafme.org/wp-content/files/2016/04/Ensemble-Adjudication-Form-PDF.pdf

National Center for Education Statistics. (2012). *Federal programs for education and related activities*. Retrieved from https://nces.ed.gov/pubs2003/2003060d.pdf

Nattiez, J. J. (1999). Inuit throat-games and Siberian throat singing: A comparative, historical, and semiological approach. *Ethnomusicology*, *43*(3), 399-418.

Niebudek-Bogusz E, Woznicka E, Zamyslowska-Szmytke E, & Sliwinska-Kowalska M. (2010). Correlation between acoustic parameters and Voice Handicap Index in dysphonic teachers. *Folia Phoniatrica et Logopaedica*, *62*(1/2), 55–60.

Novak-Leonard, J. L., & Brown, A. S. (2011). Beyond Attendance: A Multi-Modal Understanding of Arts Participation. Based on the 2008 Survey of Public Participation in the Arts. Research Report# 54. *National Endowment for the Arts*. https://files.eric.ed.gov/fulltext/ED516882.pdf

Norman, K. N. (1994). Multicultural music education: Perceptions of current and prospective music education faculty, music supervisors, and music teachers. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 56*(01), 131A.

Nzewi, M. (1999). Strategies for music education in Africa: towards a meaningful progression from tradition to modern. *International Journal of Music Education, 33*, 72–87.

Nzewi, M. (2001). Music education in Africa: Mediating the imposition of Western music education with the imperatives of the indigenous African practice. In *PASMEC 2001: Selected conference proceedings from the conference held in Lusaka, Zambia,* 21-25.

Nzewi, M. (2003). Acquiring knowledge of the musical arts in traditional society. *Musical arts in Africa: Theory, practice and education*, 13-37.

Ohlsson, A. C., Andersson, E. M., Södersten, M., Simberg, S., & Barregård, L. (2012). Prevalence of voice symptoms and risk factors in teacher students. *Journal of Voice*, *26*(5), 629-634.

Omandi, W.A. (1980). Thum: Traditional lyre music of the Luo people of Kenya. [Unpublished doctoral thesis]. University of London.

Omolo-Ongati, R. A. (2010), *Refocusing Indigenous Music for Formal Classroom Practice: A Process of Creating Partnership between the School and the Community*. Retrieved from http://www.unesco.org/culture/en/artseducation/pdf/fproseomoloongati201.pdf

Onwuegbuzie, A. J., & Johnson, R. B. (2006). The validity issue in mixed research. *Research in the Schools*, *13*(1), 48-63.

Onwuegbuzie, A. J., & Leech, N. L. (2006). Linking research questions to mixed methods data analysis procedures 1. *The Qualitative Report, 11*, 474–498.

Patton, M. Q. (2015). *Qualitative research & evaluation methods: Integrating theory and practice*. Thousand Oaks, CA: Sage Publications, Inc.

Pazhaniappan, N. (2019). In: Teach me anatomy: *The Pharynx.* https://teachmeanatomy.info/neck/viscera/pharynx/

Pestana, P. M., Vaz-Freitas, S., Manso, M. C. (2017). Prevalence of voice disorders in singers: systematic review and meta-analysis. *Journal of voice*, *31*(6), 722-727.

Phyland, D. (2017). The measurement and effects of vocal load in singing performance: How much singing can a singer sing if a singer can sing songs? *Perspectives of the ASHA Special Interest Groups*, *2*(3), 79–88.

Phyland, D. J., Oates, J., & Greenwood, K. M. (1999). Self-reported voice problems among three groups of professional singers. *Journal of Voice, 13*, 602–611.

Phyland, D.J., Pallant, J.F., Benninger, M.S., Thibeault, S.L., Greenwood, K.M., Smith, J.A., & Vallance, N. (2013). Development and preliminary validation of the EASE: A tool to measure perceived singing voice function. *Journal of Voice, 27* (4), 454-462.

Phyland, D. J., Pallant, J. F., Thibeault, S. L., Benninger, M. S., Vallance, N., & Smith, J. a. (2015). Measuring Vocal Function in Professional Music Theater Singers: Construct Validation of the Evaluation of the Ability to Sing Easily (EASE). *Folia Phoniatrica et Logopaedica*, *66*(3), 100.

Pleasants, H. (1974). *The great American popular singers*. New York: Simon & Schuster, 16.

Potter, J. (2006). *Vocal authority: Singing style and ideology*. United Kingdom: Cambridge University Press.

Potter, J., Sorrell, N. (2012). *A History of Singing*. United Kingdom: Cambridge University Press.

Porter, J. (2000). Sound of Music in Kenya. *Sound and sensibility: Acoustics in architecture, music, and the environment (5).* http://teachersinstitute.yale.edu/curriculum/units/2000/5/00.05.07.x.html

Powers, H. (1980). Language models and musical analysis. *Ethnomusicology, 5*, 303–362.

Qualtrics. (2018). Qualtrics [Computer software]. Provo, Utah, USA: Qualtrics. Retrieved from http://www.qualtrics.com

Rachele, R. (2019). Overtone singing around the globe. In M. Hoch (Ed.), *So you want to sing world music: A guide for performers* (pp. 379-393). Maryland: Rowman & Littlefield.

Radionoff, S. (2015). Artistic vocal styles and techniques. In: M.S. Benninger, T. Murry, & M.M. Johns III (eds.) *The performer's voice* (pp. 51-59). Abingdon Oxfordshire, United Kingdom: Plural Publishing.

Ravall, S., & Simberg, S. (2020). Voice disorders and voice knowledge in choir singers. *Journal of Voice*, *34*(1), 157.e1-157.e8.

Reid, C. L. (1971). *The free voice.* New York: The Joseph Patelson Music House.

Reinhert, K. (2019). Singers in higher education: Teaching popular music vocalists. *The Bloomsbury Handbook of Popular Music Education: Perspectives and Practices*, 127-140.

Renk, E., Sulica, L., Grossman, C., Georges, J., & Murry, T. (2016). VHI-10 and SVHI-10 Differences in singers' self-perception of dysphonia severity. *Journal of Voice*, *31*(3), 383-e1.

Republic of Kenya. (2007). *Kenya Vision 2030: The popular version*. http://www.vision2030.go.ke/about-vision-2030/

Republic of Kenya. (2015). *National Music Policy*. Nairobi, Kenya: Government Printer.

Roll, C. (2016). The evolution of the female Broadway belt voice: implications for teachers and singers. *Journal of Voice*, *30*(5), 639-e1.

Rosa, M., Behlau, M. (2017). Mapping of vocal risk in amateur choir. *Journal of Voice*, *31*(1), 118-e1.

Rosen C.A., & Murry T. (2000). Voice Handicap Index in singers. *Journal of Voice,* 14, 370–377.

Rosen, C. A., Lee, A. S., Osborne, J., Zullo, T., & Murry, T. (2004). Development and validation of the Voice Handicap Index-10. *The Laryngoscope*, *114*(9), 1549-1556.

Roethlisberger, F. J. (1976). *Management and the worker: An account of a research program conducted by the Western Electric Co., Hawthorne Works, Chicago*.

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.

Russell, A., Oates, J., & Greenwood, K. M. (1998). Prevalence of voice problems in teachers. *Journal of voice*, *12*(4), 467-479.

Ryan, J. (2017, September 17). Adele can make full recovery says renowned surgeon who has previously treated the 'Hello' singer. *New York Daily News*. http://www.nydailynews.com/entertainment/gossip/confidential/adele-overcome-voice-problems-article-1.3502283

Sadolin, C. (2000). *Complete vocal technique*. Copenhagen, Denmark: Shout Publishing.

Saldias, M., Guzman, M., Miranda, G., & Laukkanen, A. M. (2019). A computerized tomography study of vocal tract setting in hyperfunctional dysphonia and in belting. *Journal of Voice*, *33*(4), 412-419.

Salkind, N. J. (2007). *Encyclopedia of measurement and statistics.* Thousand Oaks, CA: Sage Publications, Inc. doi: 10.4135/9781412952644

Salvatico de Aquino, F., & da Silva Teles, L. C. (2013). Vocal self-perception of professional singers. *Revista CEFAC*, *15*(4), 986-992.

Sandgren, M. (2002). Voice, soma, and psyche: a qualitative and quantitative study of opera singers. *Medical problems of performing artists*, *17*(1), 11-22.

Sapir, S. (1993). Vocal attrition in voice students: survey findings. *Journal of Voice*, *7*(1), 69-74.

Sapir, S., Mathers-Schmidt, B., & Larson, G. W. (1996). Singers' and non-singers' vocal health, vocal behaviours, and attitudes towards voice and singing: indirect findings from a questionnaire. *International Journal of Language & Communication Disorders*, *31*(2), 193-209.

Sataloff, R. T. (1997). The evaluation of voice disorders. *Hospital Medicine, 33*(4), 13-31.

Sataloff, R. T. (2001). Professional voice users: The evaluation of voice disorders. *Occupational Medicine, 16*(4), 633.

Sataloff, R. T. (2017a). *Professional voice: The science and art of clinical care* (4th ed.). San Diego, CA: Plural Publishing, Inc.

Sataloff, R. T. (2017b). *Vocal health and pedagogy: Science, assessment, and treatment, (*3rd ed.). San Diego, CA: Plural Publishing, Inc.

Sataloff, R. T., Hawkshaw, M. J., Johnson, J. L., Ruel, B., Wilhelm, A., & Lurie, D. (2012). Prevalence of abnormal laryngeal findings in healthy singing teachers. *Journal of Voice*, *26*(5), 577-583.

Sataloff, R. T., & Spiegel, J. R. (1991). Care of the professional voice. *Otolaryngologic Clinics of North America*, *24*(5), 1093-1124.

Sataloff, R. T., & E Titze, I. R. (Eds.). (1991). *Vocal health and science: A compilation of articles from the NATS Bulletin and the NATS Journal*. Jacksonville, FL: The National Association of Teachers of Singing.

Schutte, H. K., & Miller, D. G. (1993). Belting and pop, nonclassical approaches to the female middle voice: some preliminary considerations. *Journal of Voice*, *7*(2), 142-150.

Schwartz, S. M. (2009). Voice range profiles of middle school and high school choral directors. *Journal of Research in Music Education*, *56*(4), 293-309.

Schwartz, S. M. (2012). Predictors of choral directors' voice handicap. *Contributions to Music Education*, 117-131.

Senoga-Zake, G. W. (1986). *Folk music of Kenya*. Nairobi, Kenya: Uzima Publishing House.

Shaw, J. (2012). The skin that we sing: Culturally responsive choral music education. *Music Educators Journal*, *98*(4), 75-81.

Shipp, T. (1987). Vertical laryngeal position: research findings and application for singers. *journal of Voice*, *1*(3), 217-219.

Sielska-Badurek, E. M., Sobol, M., Cioch, A., Osuch-Wójcikiewicz, E., Rzepakowska, A. M., & Niemczyk, K. (2017). Adaptation and validation of the singing voice handicap index into Polish. *Clinical Otolaryngology*, *42*(5), 994-999.

Sielska-Badurek, E. M., Sobol, M., Olszowska, K., Niemczyk, K. (2018). Contemporary commercial music singing students—voice quality and vocal function at the beginning of singing training. *Journal of Voice*, *32*(6), 668-672.

Simako, J. (2009). *The development of learning activities for teaching music using indigenous Tswana children's songs in Botswana primary schools: principles and practice* [Unpublished master's thesis]. University of KwaZulu-Natal.

Simberg, S., Sala, E., Tuomainen, J., Rönnemaa, A. M. (2009a). Vocal symptoms and allergy–a pilot study. *Journal of Voice*, *23*(1), 136-139.

Simberg, S., Santtila, P., Soveri, A., Varjonen, M., Sala, E., & Sandnabba, N. K. (2009b). Exploring genetic and environmental effects in dysphonia: a twin study. *Journal of Speech, Language, and Hearing Research*, *52*(1), 153-163.

Simberg, S., Udd, H., & Santtila, P. (2015). Gender differences in the prevalence of vocal symptoms in smokers. *Journal of Voice*, *29*(5), 588-591.

Sobol, M., Sielska-Badurek, E. M., & Osuch-Wójcikiewicz, E. (2018). Normative values for singing voice handicap index – systematic review and meta-analysis. *Brazilian Journal of Otorhinolaryngology (84)*1, 1-5.

Soto, A.C., Coppola, W., Campbell, P.S., & Howard, K. (2019). In Facebook group: *World Music Pedagogy.* Retrieved March 12, 2019 from https://www.facebook.com/pg/World-Music-Pedagogy-2666827566789247/about/?ref=page_internal

Sousa, V. D., & Rojjanasrirat, W. (2011). Translation, adaptation and validation of instruments or scales for use in cross-cultural health care research: a clear and user-friendly guideline. *Journal of Evaluation in Clinical Practice, 17*(2), 268–274.

Southcott, J., & Lee, A. H. C. (2008). Missionaries and Tonic Sol-fa music pedagogy in 19th-century China. *International Journal of Music Education, 26*(3), 213–228.

Smith, B. (2018a). *So you want to sing for a lifetime: A guide for performers* (Vol. 12). Maryland: Rowman & Littlefield.

Smith, B. (2018b). The art and science of lifelong singing. *Journal of Voice 32*(3), 291-299.

Smith, B., & Sataloff, R.T. (1999). *Choral pedagogy.* San Diego, CA: Singular Publishing.

Smith, B. J., & Sataloff, R. T. (2003). Choral pedagogy and vocal health. *Journal of Singing*, *59*(3), 233–239.

Smith, B., & Sataloff, R.T. (2013). *Choral pedagogy* (3rd ed.). San Diego, CA: Plural Publishing.

Smith, G. D., Dines, M., & Parkinson, T. (Eds.). (2017). *Punk pedagogies: Music, culture and learning*. Abingdon: Routledge.

Smith, G. D., Powell, B., Fish, D. L., Kornfeld, I., & Reinhert, K. (2018). Popular music education: A white paper by the Association for Popular Music Education. *Journal of Popular Music Education*, *2*(3), 289-298.

Smith, E., Gray, S. D., Dove, H., Kirchner, L., & Heras, H. (1997). Frequency and effects of teachers' voice problems. *Journal of voice*, *11*(1), 81-87.

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.

Smith, E., Lemke, J., Taylor, M., Kirchner, H. L., & Hoffman, H. (1998). Frequency of voice problems among teachers and other occupations. *Journal of voice*, *12*(4), 480-488.

Smith-Vaughn, B. J., Hooper, C., & Hodges, D. A. (2013). Laryngeal tension in adolescent choral singing. *Journal of Singing*, *69*(4), 403.

Sperry, E., Goetze, M. (2014). Vocal Versatility in Bel Canto Style. *The Choral Journal, 55*(2), 61-65.

Spivey, N. (2008). Music theater singing... Let's talk, part 2: Examining the debate on belting. *Journal of Singing*, *64*(5), 607.

Stark, J. (2003). *Bel canto: a history of vocal pedagogy* (2nd ed.). Toronto Buffalo London: University of Toronto Press.

Steinhauer, K., Klimek, M.M., & Estill, J. (2017). *The Estill Voice Model: Theory and translation.* Pittsburg, PA: Estill Voice International.

Stemple, J. C., Glaze, L., & Klaben, B. G. (2000). Pathologies of the laryngeal mechanism. *Singular Clinical Voice Pathology Theory and Management* (3rd. ed.). San Diego, 129-30.

Sundberg, J. (1974). Articulatory interpretation of the "singing formant". *The Journal of the Acoustical Society of America*, *55*(4), 838-844.

Sundberg, J. (1987). *The science of the singing voice.* DeKalb, Illinois: Northern Illinois University Press.

Sundberg, J. (2000). Where does the sound come from? In: J. Potter, (Ed.) *Cambridge companion to singing* (p. 246). Cambridge, United Kingdom: Cambridge University Press.

Sundberg, J. (2003). Research on the singing voice in retrospect. *TMH-QPSR*, *45*(1), 11-22.

Sundberg, J., Bitelli, M., Holmberg, A., & Laaksonen, V. (2017). The "Overdrive" mode in the "Complete Vocal Technique": a preliminary study. *Journal of Voice*, *31*(5), 528-535.

Sundberg, J., Gramming, P., & LoVetri, J. (1993). Comparisons of pharynx, source, formant, and pressure characteristics in operatic and musical theatre singing. *Journal of Voice*, *7*(4), 301-310.

Sundberg, J., & Romedahl, C. (2009). Text intelligibility and the singer's formant—a relationship?. *Journal of Voice*, *23*(5), 539-545.

Sundberg, J., & Thalén, M. (2015). Respiratory and acoustical differences between belt and neutral style of singing. *Journal of Voice*, *29*(4), 418-425.

Sundberg J., Thalén, M., & Popeil, L. (2012). Substyles of belting: phonatory and resonatory characteristics. *Journal of Voice*, Vol. 26, 44–50.

Swanson, F. J. (1973). *Music teaching in the junior high and middle school*. U.S.A: Appleton-Century-Crofts.

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Boston. MA: Pearson.

Talia, J. (2017). *Vocal Science for Elite Singers: A Tribute to the Unrelenting Pursuit of Excellence in the Art of Singing*. Australia: Australian Academic Press.

Tepe, E. S. (2002). A pilot survey of vocal health in young singers. *Journal of voice, 16*(2), 244-250.

Ternström, S. (1991). Physical and acoustic factors that interact with the singer to produce the choral sound. *Journal of voice*, *5*(2), 128-143.

Thurman, L. (1983). Putting horses before carts: when choral singing hurts voices. *The Choral Journal*, *23*(8), 23-28.

Thurman, L., Welch, G. (2000). Bodymind & voice: Foundations of voice ducation (Vol. 1-5, revised ed.). *Iowa City, Iowa: National Center for Voice and Speech*.

Timmerman, B., De Bodt, M. S., Wuyts, F. L., & Van de Heyning, P. H. (2005). Analysis and evaluation of a voice-training program in future professional voice users. *Journal of Voice*, *19*(2), 202-210.

Titze, I.R. (1994). *Principles of voice production.* Englewood Cliffs, NJ: Prentice Hall.

Titze, I. R. (1999). Toward occupational safety criteria for vocalization. *Logopedics Phoniatrics Vocology*, *24*(2), 49-54.

Titze, I. R. (2007). Belting and a high larynx position. *Journal of Singing*, *63*(5), 557.

Titze I.R. (2008). Voice research and technology. Quantifying tessitura in a song. *Journal of Singing*, *65*(1), 59–61.

Titze, I. R., Lemke, J., Montequin, D. (1997). Populations in the US workforce who rely on voice as a primary tool of trade: a preliminary report. *Journal of voice*, *11*(3), 254-259.

Titze, I. R., Švec, J. G., Popolo, P. S. (2003). Vocal dose measures. *Journal of Speech, Language, and Hearing Research*, Vol. 46, 919-932.

Ulloa, J. (2019). Mexico's Mariachi vocal tradition. In M. Hoch (Ed.), *So you want to sing world music: A guide for performers* (pp. 126-143). Maryland: Rowman & Littlefield.

U.S. Department of Education. (n.d.). *Every Student Succeeds Act (ESSA)*. http://www.ed.gov/essa?src=rn

University Interscholastic League (UIL). (2019). *Form 4: Choral adjudicator form.* https://www.uiltexas.org/music/resources-forms

Vilkman, E. (2004). Occupational safety and health aspects of voice and speech professions. *Folia Phoniatrica et Logopaedica*, *56*(4), 220-253.

Vintturi, J., Alku, P., Lauri, E. R., Sala, E., Sihvo, M., Vilkman, E. (2001). Objective analysis of vocal warm-up with special reference to ergonomic factors. *Journal of Voice*, *15*(1), 36-53.

Virginia Choral Directors Association (VCDA). (2019). *All-Virginia chorus auditions score sheet.* https://www.vcda.net/index.php/resources/vboda-forms.html

Volk, T. M. (1993). The history and development of multicultural music education as evidenced in the Music Educators Journal, 1967-1992. *Journal of Research in Music Education*, *41*(2), 137-155.

Wambugu, D. M. (2012). *Kenyan art music in Kenya's high school general music curriculum: A rationale for folk-song based choral music*. [Unpublished doctoral dissertation]. University of Florida.

Wamunyu, A. W. (1999). *The relationship between music teacher preparation and the national music curriculum in Kenya* [Unpublished doctoral dissertation]. Boston University.

Wanyama, M. N. (2012). Researching on Kenyan traditional music and dance today: Methodology and ethical issues revisited. *Muziki*, *9*(2), 1-8.

Ward-Steinman, P.M., (2017), Choral pedagogy responds to the media: American Idol, Glee, The Voice, The Sing-Off, and…In F. Abrahams & P.D. Head (Eds.), *The Oxford Handbook of Choral Pedagogy* (pp. 31-45). New York: Oxford University Press.

Warner, B. (2017, August 10). Why do stars like Adele keep losing their voice? *The Guardian*. Retrieved from https://www.theguardian.com/news/2017/aug/10/adele-vocal-cord-surgery-why-stars-keep-losing-their-voices

Watts, C. (2016). The prevalence of voice problems in a sample of collegiate a cappella singers. *Journal of Speech Pathology and Therapy (1)*1, 105.

Weekly, E. M., LoVetri, J. L. (2009). Follow-up contemporary commercial music (CCM) survey: who's teaching what in nonclassical music. *Journal of Voice*, *23*(3), 367-375.

Weman, H. (1960). *African music and the church in Africa*. Uppsala: Applebergs Boktryckeri.

Welch, G. F., Howard, D. M., Nix, J. (Eds.). (2019). *The Oxford handbook of singing*. New York: Oxford University Press.

White, R. C. (1976). Stop voice abuse!: Recommendations for teacher education. *Music Educators Journal*, *63*(2), 38–42.

Williams, N. R. (2003). Occupational groups at risk of voice disorders: a review of the literature. *Occupational medicine*, *53*(7), 456-460.

Wilson, P. (2004). Sinful modern music: Science and the contemporary commercial singer. *Australian Voice*, *9*, 12-16.

Winnie, B. J. (2017). Bridging the gap between classical and contemporary vocal technique: implications for the choral rehearsal. *Voice and Speech Review*, *11*(1), 55-71.

Woodruff, N. W. (2011). Contemporary Commercial Voice Pedagogy applied to the choral ensemble: An interview with Jeannette LoVetri. *Choral Journal, 52*(5), 39-53.

Woody, R. H. (2012). Playing by ear: Foundation or frill? *Music Educators Journal*, *99*(2), 82-88.

Xiques, D. J. (2014). *Solfege and sonority: Teaching music reading in the choral classroom*. New York: Oxford University Press.

Yanagisawa, E., Estill, J., Kmucha, S. T., & Leder, S. B. (1989). The contribution of aryepiglottic constriction to “ringing” voice quality—a videolaryngoscopic study with acoustic analysis. *Journal of Voice*, *3*(4), 342-350.

Yang, Y., Radhakrishnan, N., Grimmer, S., Carter-Cohn, A., Nix, J. (2015). Vocal music and pedagogy of Chinese, African, and Indian Genres. In G. Welch, D. Howard, & J. Nix (Eds.), *The Oxford Handbook of Singing* [pp. 751-773]. New York: Oxford University Press.

Yiu, E. M. L., Chan, R. M. (2003). Effect of hydration and vocal rest on the vocal fatigue in amateur karaoke singers. *Journal of Voice*, *17*(2), 216-227.

Young, S. M. (1996). Music teachers' attitudes, classroom environments, and music activities in multicultural music education. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 57*(1), 2934A.

Ziegler, A., & Johns, M. M. (2012). Health promotion and injury prevention education for student singers. *Journal of Singing*, *68*(5), 531-541.

Appendix A. Image Usage Permission, Blue Tree Publishing

From: Info BTP <info@bluetreepublishing.com>
Subject: Re: Images
Date: April 5, 2020 at 10:29:18 PM EDT
To: Morgan Burburan <xxxxxxxxxxxxx@gmail.com>
Reply-To: Info BTP <info@bluetreepublishing.com>

HI,
thank you for your message, yes you have permission to use these pictures in your dissertation giving Blue Tree Publishing credit.
If you have any questions please let us know and best wishes on your dissertation
Robert

Appendix B. Singer's Questionnaire

1. Age: ____

2. Sex: Male Female

3. Nationality: _____ Race: _____

4. Where do you live?

   _____ _____ _____
   City/Town/Village Province/State Country

5. Highest education level achieved: _____

6. Choose the option that best describes you:
   ___ I sing as a hobby/amateur
   ___ I am working towards/studying to be a professional singer
   ___ I am a semi-professional singer (partial income derived from singing)
   ___ I am a music educator
   ___ I am a professional singer

7. Occupation: _____

8. In the course of your typical day, which of these activities do you often engage in:
   ___ Talking for long period of time ___ Loud talking ___ Quiet talking
   ___ Singing ___ Shouting/yelling ___ Throat clearing
   ___ Talking on the phone ___ Talking over a moving vehicle
   ___ None of the above

9. If you are a music teacher or teach music regularly as your occupation:
   a. How many years have you taught? ___
   b. What grade level do you teach? _____
   c. What courses to you teach? _____
   d. Have voice problems ever impeded your ability to teach (speaking or singing)? _____

<u>Singing Background:</u>

10. How long have you been singing in a formal setting?
    ___ Less than 2 years
    ___ 2-5 years
    ___ 5-10 years
    ___ 10-20 years
    ___ More than 20 years
11. How long have you sung in this ensemble?
    ___ Less than 1 year
    ___ 1-2 years

___ 3-4 years
___ 5-10 years
___ More than 10 years

12. Do you sing outside this ensemble? Yes No
    a. If yes: Where: _____
    b. Genres/styles: _____
    c. Hours sing per week: _____

13. Did you have a teacher when you started to sing? Yes No

14. Do you know what the tessitura, range, and/or extension of your voice is? Yes No

15. What is your voice classification? _____

16. How much formal voice training have you had?
    ___ None
    ___ Less than 1 year
    ___ 1-2 years
    ___ 3-4 years
    ___ More than 5 years

17. Do you currently take voice lessons? Yes No

18. If you have had voice training, where did you get it? Choose all that apply.
    ___ No training ___ Private lessons ___ Group voice class
    ___ Church/community choir ___ School/College choir ___ Home study/family member
    ___ Friends/peers ___ Self-study ___ Other: _____

19. What style(s) of music do you sing? (Choose all that apply)
    ___Choral ___CCM (Genres such as popular, Jazz, Musical Theatre, Country, rock, etc.)
    ___Traditional Folk ___ Classical Bel Canto
    ___ Other(s): _____

20. What do you consider your primary genre that you sing?
    _____

21. Do you warm-up before singing?
    Never Almost Never Sometimes Almost Always Always

22. Number of hours that you sing: ____ per day ____ per week
23. How long can you sing without feeling hoarse in one typical rehearsal?
    ___ 0-1 hour ___ 1- 2 hours ___ 2-3 hours ___ 3-4 hours ___4+ hours

24. Does this vary by genre? Yes No

25. If yes, which genres make you feel hoarse/vocally tired faster?
    ___Choral
    ___CCM (Genres such as popular, Jazz, Musical Theatre, Country, rock, etc.)
    ___Traditional Folk
    ___ Classical Bel Canto
    ___ Other: _____

26. Is your *typical* singing voice:
    a. __Very light __ Moderately light __ In Between __ Moderately heavy __ Very heavy
    b. __Very bright __ Moderately bright __ In Between __ Moderately warm__ Very warm
    c. __Very weak __ Moderately weak __ In Between __ Moderately strong __ Very strong
    d. __Not breathy __ Slightly breathy __ Moderate __ Very breathy __ Extremely breathy
    e. __Not rough __ Slightly rough __ Moderate __ Very rough __ Extremely rough
    f. __Not nasal __ Slightly nasal __ Moderate __ Very nasal __ Extremely nasal

27. How do you define healthy singing?

_____

Medical:

28. Have you ever experienced a voice problem? Yes No

29. Have you experienced any of these disorders in the past three years?

___ Allergies	___ Gastroesophageal reflux (GERD)
___ Reoccurring Sinus Infections	___ Reoccurring Laryngitis
___ Asthma	___ Stomach or duodenal ulcers
___ Anorexia	___ Bulimia

30. What medications do you currently take (including over the counter medication, vitamins, herbal supplements)?

___ Decongestants or antihistamines	___ Chemotherapy
___ Steroids	___ Oral Contraceptives
___ Ibuprofen	___ Throat lozenges
___ Vitamins	___ Other: _____

31. Please select the option that best describes your consumption habits:

Coffee:	Never	Occasionally	1 cup/day	2-3 cups/day	3+ cups/day
Soda:	Never	Occasionally	1 /day	2-3 /day	3+ /day
Tobacco:	Never	Occasionally	<1 pack/day	1+ pack/day	2+ pack/day
Alcohol:	Never	Occasionally	1-2/week	3-5/week	6-10/week
Water:	<16oz./day	16-32oz/day	32-48oz/day	48-64oz/day	64+oz/day
Sleep (average):	3-4 hours	5-6 hours	7-8 hours	9-10 hours	10+ hours

32. Check all that apply:

___ Regularly exposed to smoky environments
___ Voice is worse in the morning
___ Voice gets worse throughout the day
___ Frequent sore throats
___ Jaw problems
___ Excessive dryness
___ Frequent cough
___ Frequent heartburn
___ Regularly eat late at night
___ Speak extensively
___ Frequent throat clearing
___ Frequent yelling or loud talking
___ Under high stress
___ Weight lifting
___ Talking in noisy environments
___ Regular exercise
___ Have had a cold/sinus infection/post nasal drip in the past three weeks
___ Regularly exposed to chemicals (ex. Cleaning chemicals, occupational hazards)

33. Have you experienced any of the following symptom(s) in the past three years?

	Check if Yes	When began?	How long lasted?	Still ongoing?
Hoarseness				
Difficulty projecting the voice				
Frequent vocal Fatigue				
Loss of singing range				
Trouble speaking or singing				
Voice related discomfort				
Increased effort to talk				
Monotone Voice				
Chronic throat dryness or soreness				
Frequent throat clearing				
Wobbly or shaky voice				
Singing flat consistently				
Loss of ability to sing softly				
Throat pain				
Neck muscle tension				
Running out of air				
Other: _____				

34. Do you feel that any of these problems affect your career? Yes No Sometimes

35. In the past three years, have you:

___ Stopped using your voice because of vocal pain/discomfort
___ Gone to a voice teacher because of an issue with your singing voice
___ Self-medicated for vocal pain/discomfort
___ Gone to a speech therapist
___ Gone to a medical doctor (ENT, Otolaryngologist, etc.). If yes:

a. What was your diagnoses? Choose all that apply:

___ Benign lesion (ex. vocal nodule, vocal polyp, vocal cyst)
___ Malignant lesions (ex. cancer)
___ Neurogenic (ex. vocal fold paralysis, spasmodic dysphonia)
___ Musculoskeletal Tension Disorder (with normal larynx)
___ Inflammation (acute erythema of vocal folds)
___ Atypical (normal larynx, sudden onset)
___ Other _____

How was the problem treated? Choose all that apply.

___ Vocal rest
___ Speech and language therapy
___ Voice lessons
___ Surgery
___ Laryngectomy
___ No treatment
___ Other: _____

36. Are you willing to participate in a short interview if randomly selected?
YES NO

Appendix C. Singing Voice Handicap Index *(SVHI) (Cohen et al., 2007)*

Instructions: These are statements that many people have used to describe their voices and the effects of their voices on their lives. Check the response that indicates how frequently you have the same experience. (0 = never, 1 = almost never, 2 = sometimes, 3 = almost always, 4 = always)

1. It takes a lot of effort to sing.	0 1 2 3 4
2. My voice cracks and breaks. I am frustrated by my singing.	0 1 2 3 4
3. I am frustrated by my singing.	0 1 2 3 4
4. People ask "What is wrong with your voice?" when I sing.	0 1 2 3 4
5. My ability to sing varies day to day.	0 1 2 3 4
6. My voice "gives out" on me while I am singing.	0 1 2 3 4
7. My singing voice upsets me.	0 1 2 3 4
8. My singing problems make me not want to sing/perform.	0 1 2 3 4
9. I am embarrassed by my singing.	0 1 2 3 4
10. I am unable to use my "high voice."	0 1 2 3 4
11. I get nervous before I sing because of my singing problems.	0 1 2 3 4
12. My speaking voice is not normal.	0 1 2 3 4
13. My throat is dry when I sing.	0 1 2 3 4
14. I've had to eliminate certain songs from my singing/performances.	0 1 2 3 4
15. I have no confidence in my singing voice.	0 1 2 3 4
16. My singing voice is never normal.	0 1 2 3 4
17. I have trouble making my voice do what I want it to.	0 1 2 3 4
18. I have to "push it" to produce my voice when singing.	0 1 2 3 4
19. I have trouble controlling the breathiness in my voice.	0 1 2 3 4
20. I have trouble controlling the raspiness in my voice.	0 1 2 3 4
21. I have trouble singing loudly.	0 1 2 3 4
22. I have difficulty staying on pitch when I sing.	0 1 2 3 4
23. I feel anxious about my singing.	0 1 2 3 4
24. My singing sounds forced.	0 1 2 3 4
25. My speaking voice is hoarse after I sing.	0 1 2 3 4
26. My voice quality is inconsistent.	0 1 2 3 4
27. My singing voice makes it difficult for the audience to hear me.	0 1 2 3 4
28. My singing makes me feel handicapped.	0 1 2 3 4
29. My singing voice tires easily.	0 1 2 3 4
30. I feel pain, tickling, or choking when I sing.	0 1 2 3 4
31. I am unsure of what will come out when I sing.	0 1 2 3 4
32. I feel something is missing in my life because of my inability to sing.	0 1 2 3 4
33. I am worried my singing problems will cause me to lose money.	0 1 2 3 4
34. I feel left out of the music scene because of my voice.	0 1 2 3 4
35. My singing makes me feel incompetent.	0 1 2 3 4

36. I have to cancel performances, singing engagements, rehearsals, or practices because of my singing. 0 1 2 3 4

37. Please circle the words that match how serious you feel your voice problem is:

No Problem Mild Problem Moderate Problem Severe Problem

38. On a scale of 1-10, with 1 being least talkative and 10 being most talkative, how would you rate yourself?

1 2 3 4 5 6 7 8 9 10

Appendix D. Vocal Fatigue Index (VFI) (Nanjundeswaran, Jacobson, Schmidt, & Abbott, 2015)

Subscale 1					
1. I don't feel like talking after a period of voice use	0	1	2	3	4
2. My voice feels tired when I talk more.	0	1	2	3	4
3. I experience increased sense of effort with talking.	0	1	2	3	4
4. My voice gets hoarse with voice use.	0	1	2	3	4
5. It feels like work to use my voice.	0	1	2	3	4
6. I tend to generally limit my talking after a period of voice use.	0	1	2	3	4
7. I avoid social situations when I know I have to talk more.	0	1	2	3	4
8. I feel I cannot talk to my family after a work day.	0	1	2	3	4
9. It is effortful to produce my voice after a period of voice use.	0	1	2	3	4
10. I find it difficult to project my voice with voice use.	0	1	2	3	4
11. My voice feels weak after a period of use.	0	1	2	3	4
Subscale 2					
12. I experience pain in the neck at the end of the day with voice use.	0	1	2	3	4
13. I experience throat pain at the end of the day with voice use.	0	1	2	3	4
14. My voice feels sore when I talk more.	0	1	2	3	4
15. My throat aches with voice use.	0	1	2	3	4
16. I experience discomfort in my neck with voice use.	0	1	2	3	4
Subscale 3					
17. My voice feels better after I have rested.	0	1	2	3	4
18. The effort to produce my voice decreases with rest.	0	1	2	3	4
19. The hoarseness of my voice decreases with rest.	0	1	2	3	4

Appendix E. Evaluation of the Ability to Sing Easily (EASE) (Phyland *et al*., 2013)

	Not at All (0)	Mildly (1)	Moderately (2)	Extremely (3)
Subscale 1: (Fatigue)				
1. My voice is husky.	0	1	2	3
2. My voice is dry/scratchy.	0	1	2	3
3. My throat muscles are feeling overworked.	0	1	2	3
4. My voice feels good.	0	1	2	3
5. My top notes are breathy.	0	1	2	3
6. The onsets of my notes are delayed or breathy.	0	1	2	3
7. My voice sounds rich and resonant.	0	1	2	3
8. My voice is ready for performance if required.	0	1	2	3
9. My voice is tired.	0	1	2	3
10. My voice is worse than usual.	0	1	2	3
Subscale 2: (Pathology)				
11. My voice cracks and breaks.	0	1	2	3
12. My voice is breathy.	0	1	2	3
13. I am having difficulty with my breath for long phrases.	0	1	2	3
14. My voice is cutting out On some notes.	0	1	2	3
15. I am having difficulty changing registers.	0	1	2	3
16. Today I am having difficulty with my high notes.	0	1	2	3
17. I am having difficulty projecting my voice.	0	1	2	3
18. I am having difficulty singing softly.	0	1	2	3
19. Singing is hard work.	0	1	2	3
20. I am having difficulty Sustaining long tones.	0	1	2	3

Appendix F. Consensus Auditory-Perceptual Evaluation of Voice (CAPE-V) Instructions (ASHA, 2006)

Consensus Auditory-Perceptual Evaluation of Voice (CAPE-V)

PURPOSE AND APPLICATIONS

The Consensus Auditory-Perceptual Evaluation of Voice (CAPE-V) was developed as a tool for clinical auditory-perceptual assessment of voice. Its primary purpose is to describe the severity of auditory-perceptual attributes of a voice problem, in a way that can be communicated among clinicians. Its secondary purpose is to contribute to hypotheses regarding the anatomic and physiological bases of voice problems and to evaluate the need for additional testing.

CAPE-V is *not* intended for use as the only means of determining the nature of the voice disorder. It is not to be used to the exclusion of other tests of vocal function. Finally, it is not expected to demonstrate a 1:1 relation to results from other tests of vocal function.

ORIGIN

The CAPE-V was developed from a consensus meeting sponsored by the American Speech-Language-Hearing Association's (ASHA) Division 3: Voice and Voice Disorders, and the Department of Communication Science and Disorders, University of Pittsburgh, held in Pittsburgh on June 10-11, 2002. Attending this meeting were speech-language pathologists (SLPs) who specialize in voice disorders and invited experts in human perception (see appendix). The participants' charge was to develop standardized guidelines for auditory-perceptual evaluation of voice, based on theory and data in psychoacoustics, psychometric scaling, and voice perception. Clinical practicality and brevity of administration were also considered in developing these guidelines.

A working group was charged to formalize a consensus statement about minimal recommended standards for optimizing auditory-perceptual judgments in the clinical assessment of voice disorders by speech-language pathologists. The CAPE-V is the initial product. The hope is that wide-spread use of the current CAPE-V and its future development will encourage a more consistent approach and ultimately more research in the perceptual evaluation of voice disorders. The present document is the preliminary result of the consensus meeting. The ultimate goal is standardization of a reliable tool for clinical voice quality measurement.

DESIGN CONSIDERATIONS

The consensus was that the clinical evaluation of auditory-perceptual characteristics of voice should be derived from a tool with the following attributes: (a) perceptual dimensions should reflect a minimal set of clinically meaningful, perceptual voice parameters, identified by a group of expert clinicians; (b) procedures and results should be obtainable expediently; (c) procedures and results should be applicable to a broad range of vocal pathologies and clinical settings; (d) ratings ultimately should be demonstrated to optimize reliability within and across clinicians , and (e) ultimately, exemplars should be available for training.

DESCRIPTION AND INSTRUCTIONS

General Description of the Tool: The CAPE-V indicates salient perceptual vocal attributes, identified by the core consensus group as commonly used and easily understood. The attributes are: (a) Overall Severity; (b) Roughness; (c) Breathiness; (d) Strain; (e) Pitch; and (f) Loudness. The CAPE-V displays each attribute accompanied by a 100 millimeter line forming a visual analog scale (VAS). The clinician indicates the degree of perceived deviance from normal for each parameter on this scale, using a tic mark. For each dimension, scalar extremes are unlabeled. Judgments may be assisted by referring to general regions indicated below each scale on the CAPE-V: “MI” refers to "mildly deviant," “MO” refers to “moderately deviant,” and “SE” refers to "severely deviant." A key issue is that the regions indicate *gradations* in severity, rather than discrete points. The clinician may place tick marks at any location along the line.” Ratings are based on the clinician’s direct observations of the patient’s performance during the evaluation, rather than patient report or other sources.

To the right of each scale are two letters, “C” and “I.” “C” represents "consistent" and “I” represents "intermittent" presence of a particular voice attribute. The rater circles the letter that best describes the consistency of the judged parameter. A judgment of “consistent” indicates that the attribute was continuously present throughout the tasks. A judgment of “intermittent” indicates that the attribute occurred inconsistently within *or* across tasks. For example, an individual may consistently exhibit a strained voice quality across all tasks, which include sustained vowels and speech. In this case, the rater would circle “C” to the right of the strain scale. In contrast, another individual might exhibit consistent strain during vowel production, but intermittent strain during one or more connected speech task. In this case, the rater would circle “I” to the right of the strain scale.

Definitions of Vocal Attributes: **OVERALL SEVERITY:** Global, integrated impression of voice deviance. **Roughness:** Perceived irregularity in the voicing source. **Breathiness:** Audible air escape in the voice. **Strain:** Perception of excessive vocal effort (hyperfunction). **Pitch:**

Perceptual correlate of fundamental frequency. This scale rates whether the individual's pitch deviates from normal for that person's gender, age, and referent culture. The direction of deviance (high or low) should be indicated in the blank provided above the scale. **Loudness:** Perceptual correlate of sound intensity. This scale indicates whether the individual's loudness deviates from normal for that person's gender, age, and referent culture. The direction of deviance (soft or loud) should be indicated in the blank provided above the scale.

Blank scales and additional features: The six standard vocal attributes included on the CAPE-V are considered the minimal set of parameters for describing the auditory-perceptual characteristics of disordered voices. The form also includes two unlabeled scales. The clinician may use these to rate additional prominent attributes required to describe a given voice. The clinician may indicate the presence of other attributes or "positive signs" not noted elsewhere under "Additional features." If an individual is aphonic, this should be noted under "additional features" and no additional marks should be made on the scales.

Data collection: The individual should be seated comfortably in a quiet environment. The clinician should audio record the individual's performance on three tasks: vowels, sentences, and conversational speech. Standard recording procedures should be used that incorporate a condensor microphone placed 45 degrees off from the front of the mouth and a 4 cm mike-to-mouth distance. Audio recordings are recommended to be made onto a computer with 16 bits of resolution and a signal sampling rate of no less than 20 KHertz (details included in Appendix; see http://www.ncvs.org/rescol/sumstat/sumstat.pdf).

Task 1: Sustained vowels: Two vowels were selected for this task. One is considered a lax vowel (/a/) and the other tense (/i/). In addition, the vowel, /i/, is the sustained vowel used during videostroboscopy. Thus, the use of this vowel during this task offers an auditory comparison to that produced during a stroboscopic exam.

The clinician should say to the individual, "The first task is to say the sound, /a/. Hold it as steady as you can, in your typical voice, until I ask you to stop." (The clinician may provide a model of this task, if necessary) The individual performs this task three times for 3-5 sec each."Next, say the sound, /i/. Hold it as steady as you can, in your typical voice, until I ask you to stop." The individual performs this task three times for 3-5 sec each.

Task 2: Sentences: Six sentences were designed to elicit various laryngeal behaviors and clinical signs. The first sentence provides production of every vowel sound in the English language, the second sentence emphasizes easy onset with the /h/, the third sentence is all voiced, the fourth

sentence elicits hard glottal attack, the fifth sentence incorporates nasal sounds, and the final sentence is weighted with voiceless plosive sounds.

The clinician should give the person being evaluated flash cards, which progressively show the target sentences (see below) one at a time. The clinician says, “Please read the following sentences one at a time, as if you were speaking to somebody in a real conversation.” (Individual performs task, producing one exemplar of each sentence.) If the individual has difficulty reading, the clinician may ask him or her to repeat sentences after verbal examples. This should be noted on the CAPE-V form. The sentences are: (a) The blue spot is on the key again; (b) How hard did he hit him? (c) We were away a year ago; (d) We eat eggs every Easter; (e) My mama makes lemon jam; (f) Peter will keep at the peak.

Task 3: Running speech: The clinician should elicit at least 20 seconds of natural conversational speech using standard interview questions such as, “Tell me about your voice problem." or “Tell me how your voice is functioning."

Data scoring: The clinician should have the individual perform all voice tasks—including vowel prolongation, sentence production, and running speech, before completing the CAPE-V form. If performance is uniform across all tasks, the clinician should mark the ratings indicating overall performance for each scale. If the clinician notes a discrepancy in performance across tasks, he or she should rate performance on each task separately, *on a given line.* Only one CAPE-V form is used per individual being evaluated. In the case of discrepancies across tasks, tick marks should be labeled with the task number. Tick marks reflecting vowel prolongation should be labeled #1 (see form). Tick marks reflecting running speech should be labeled #2. Tick marks reflecting story retelling should be labeled #3. In the rare event that the clinician perceives discrepancies within task type (for example, /a/ versus /i/), he or she may further label the ratings accordingly [for example, 1/a/ versus 1/i/ to reflect the different vowels, or 2(a)-(b)-(c)-(d)-(e)- or (f) for the different sentences]. Unlabeled tick marks indicate uniform performance. See examples below. [Note: Using labels to indicate discrepancies/variation across tasks in the severity of an attribute is different than indicating that an attribute is displayed intermittently (I). If an attribute is judged to have equal severity whenever it appears, but it is not present all the time, “I” should be circled to indicate that the attribute is intermittent and no additional labeling needs to be done.]

Scoring: After the clinician has completed all ratings, he or she should measure ratings from each scale. To do so, he or she should physically measure the distance in mm from the left end of the scale. The mm score should be written in the blank space to the far right of the scale, thereby

relating the results in a proportion to the total 100 mm length of the line. The results can be reported in two possible ways. First, results can indicate distance in mm to describe the degree of deviancy, for example “73/100” on “strain.” Second, results can be reported using descriptive labels that are typically employed clinically to indicate the general amount of deviancy, for example “moderate-to-severe” on “strain.” We strongly suggest using both forms of reporting.

It is strongly recommended that for all rating sessions following the initial one, the clinician have a paper or electronic copy of the previous CAPE-V ratings available for comparison purposes. He or she should also rate subsequent examinations based on direct comparisons between earlier and current audio recordings. Such an approach should optimize the internal consistency/reliability of repeated sequential ratings within a patient, particularly for purposes of assessing treatment outcomes. Although difficult, clinicians are encouraged to make every effort to minimize bias in all ratings. We acknowledge that this solution is imperfect.

Other procedures: The clinician can indicate prominent observations about resonance phenomena under “Comments about resonance.” Examples include, but are not limited to hyper- or hyponasality, and cul-de-sac resonance.

Cautions: Data available on the reliability of all rating scales for voice assessment indicate that both intra- and inter-judge agreement varies widely. Although we have attempted to limit sources of variability in the present tool, its reliability and validity have not yet been assessed. Future editions are projected to include referent voice recordings as “anchors” as well as training modules.

Examples: Refer to Example Form 1 for the following description. The patient displays the following ratings: Moderate to severe degree of overall dysphonia (78/100), moderate roughness (56/100), moderate to severe breathiness (74/100) and strain (62/100). Modal pitch (35/100) was judged to be mild to moderately low for the person’s gender and age while the loudness (0/100) was judged to be normal. All voice attributes were judged as consistently present in this assessment. The patient in Example 1 also exhibits a positive sign for abnormal oral-pharyngeal resonance in the form of mild hypernasality.

Refer to Example Form 2 for the following description. The patient in Example 2 is status-post therapy, and displays the following ratings currently: Inconsistently mild degree of dysphonia (27/100), just noticeable roughness (3/100), mild to moderate inconsistent breathiness (38/100), inconsistently mild strain (9/100), consistently normal pitch (1/100), and inconsistently mild to moderate reduced loudness (29/100). He was further exhibits consistent mild to moderate

asthenia (39/100). Most of the parameters are improved relative to earlier, pre-therapy ratings (Example Form 2).

Acoustic Recordings

Based on Titze (1994), http://www.ncvs.org/rescol/sumstat/sumstat.pdf Many sections involve direct quotes

. Use professional grade condenser microphone (omnidirectional or cardioid) with a minimum sensitivity of -60 dB (Titze & Winholtz, 1993)

. For vowel utterances, the mouth-to-microphone distance should be held constant and less than 10 cm (preferably 3-4 cm) to avoid an artificial "wow" and to maintain a high signal-to-noise ratio; a miniature head-mounted microphone is recommended (Winhold & Titze, in press).

. Close microphone distances require off-axis positioning (45 degrees to op degrees from the mouth axis) to reduce aerodynamic noise from the mouth in speech.

. If samples are digitized into a computer, a 16-bit A/D converter or DAT recorder is recommended, but this must be accompanied by conditioning electronics (amplifiers, filters) that have signal-to-noise ratios in the 85-95 dB range (Doherty & Shipp, 1988).

. If samples are digitized into a computer, sampling frequencies of 20-100kHz should be used, depending on the degree of interpolation between samples that the analysis software provides (Titze, Horii, & Scherer, 1987; Milenkovic, 1987; Deem *et al*., 1989).

. If digitizing into a computer is used, manufacturers of workstations for acoustic voice analysis should be encouraged to provide DC coupling and low-frequency fidelity in acquisition hardware to accommodate physiologic signals (e.g., an electroglottograph, a flow mask) that augment the microphone signal. For all input signals, real-time feedback for clipping should be provided to avoid overloading the A/D converters. For DC coupling, there should be minimal drift and the drift should be reported and calibratable.

. Line-level inputs (on the order of a few hundred millivolts) should be provided as a direct interface to the outputs of transducers, so that expensive high-fidelity analog preamplifiers can be bypassed.

. A digital audio tape (DAT) recorder should be used to store signals, unless A/D conversion is directly to the computer (Doherty & Shipp, 1988).

. Recordings should be made in a sound-treated room (ambient noise < 50 dB); given that 120 Hz is very close to the average normal male speaking F_O , special care should be given to the removal of noise sources in the room that create 60 Hz hum and its associated harmonics. In general, one should specify the spectral weighting of the allowable noise in a sound-treated room. This is particularly important if inverse filtering from the microphone signal is attempted.

Appendix G. Consensus Auditory-Perceptual Evaluation of the Voice (CAPE-V) (Kempster *et al*., 2009)

Consensus Auditory-Perceptual Evaluation of Voice (CAPE-V)

Voice Sample #:_____

The following parameters of voice quality will be rated upon completion of the following tasks:
1. Sustained vowels, /a/ and /i/ for 3-5 seconds duration each.
2. Sentence production:
   a. The blue spot is on the key again.
   b. How hard did he hit him?
   c. We were away a year ago.
   d. We eat eggs every Easter.
   e. My mama makes lemon muffins.
   f. Peter will keep at the peak.
3. Spontaneous speech in response to: "Tell me about your voice problem." or "Tell me how your voice is functioning."

Legend: C = Consistent I = Intermittent
MI = Mildly Deviant
MO =Moderately Deviant
SE = Severely Deviant

				SCORE
Overall Severity	_____ MI MO SE	C	I	/100
Roughness	_____ MI MO SE	C	I	/100
Breathiness	_____ MI MO SE	C	I	/100
Strain	_____ MI MO SE	C	I	/100
Pitch	(Indicate the nature of the abnormality): _____ _____ MI MO SE	C	I	/100
Loudness	(Indicate the nature of the abnormality): _____ _____ MI MO SE	C	I	/100
_____	_____ MI MO SE	C	I	/100
_____	_____ MI MO SE	C	I	/100

COMMENTS ABOUT RESONANCE: NORMAL OTHER (Provide description):_____
_____

ADDITIONAL FEATURES (for example, diplophonia, fry, falsetto, asthenia, aphonia, pitch instability, tremor, wet/gurgly, or other relevant terms):

Clinician:_____

Appendix H. Interview Questions

Semi-structured interview questions (choir members).

1. How would you describe the overall status and quality of your voice right now?
2. Do you find value in singing in multiple genres? Why?
3. Is your personal vocal health a factor of consideration for you when singing in multiple genres?
4. Are there any genres or vocal styles that you sing that make you feel more vocally fatigued than others? If so, what are they? Why do you think that is so?
5. Do you change the way that you use your voice or the quality depending on when, where, and what you are singing? If so, please describe.
6. Do you perceive any similarities or relationship with how you use your voice between traditional cultural music from Kenya and any genre within Contemporary Commercial Music (CCM)?
7. When you sing choral music, do you use a classical/Bel Canto approach?
8. How would you compare Bel Canto, classical vocal techniques to CCM? Traditional Kenyan music?
9. As a music educator, is vocal health a consideration for you when programming music? If so, do you find any specific genres problematic?
10. Do you adapt how you teach vocal technique by genre? Why or why not? If so, how?
11. Is there anything else regarding this topic that you would like to add?

Semi-structured interview questions (conductor).

1. What role does vocal health and vocal fatigue play in your process when programming a concert?
2. Are there any genres that seem to generate vocal fatigue more quickly into your ensembles? If so, what are they?
3. Do you typically program traditional Kenyan music, CCM, and traditional classical choral music in concert programs? Why or why not?
4. What do you feel is the role of warm-ups regarding vocal health and vocal fatigue?
5. Does your ideal for tone quality vary by genre being performed? If so, how?
6. If so, how do you address these varying tone qualities regarding the vocal health of your singers?
7. Is there anything else regarding this topic that you would like to add?

Appendix I. *IRB Approval*

USF
UNIVERSITY OF SOUTH FLORIDA

RESEARCH INTEGRITY AND COMPLIANCE
Institutional Review Boards, FWA No. 00001669
12901 Bruce B. Downs Blvd., MDC035 • Tampa, FL 33612-4799
(813) 974-5638 • FAX (813) 974-7091

May 17, 2018

Morgan Burburan School of Music Tampa, FL 33612

RE: **Expedited Approval for Initial Review**

IRB#: Pro00035486

Title: Vocal Health of Choral Singers from Kenya and the United States: Dysphonia and Vocal Fatigue in Relation to Musical Genres

Study Approval Period: 5/16/2018 to 5/16/2019

Dear Ms. Burburan:

On 5/16/2018, the Institutional Review Board (IRB) reviewed and **APPROVED** the above application and all documents contained within, including those outlined below.

Approved Item(s):
Protocol Document(s):
Protocol, Version #1, May 5, 2018

Consent/Assent Document(s)*:
Vocal Health Kenya Consent Form.docx

*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab. Please note, these consent/assent documents are valid until the consent document is amended and approved. A consent from granted a waiver of documentation is not stamped.

It was the determination of the IRB that your study qualified for expedited review which includes activities that (1) present no more than minimal risk to human subjects, and (2) involve only procedures listed in one or more of the categories outlined below. The IRB may review research through the expedited review procedure authorized by 45CFR46.110. The research proposed in this study is categorized under the following expedited review category:

(6) Collection of data from voice, video, digital, or image recordings made for research purposes.

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Your study qualifies for a waiver of the requirements for the documentation of informed consent as outlined in the federal regulations at 45CFR46.117(c) which states that an IRB may waive the requirement for the investigator to obtain a signed consent form for some or all subjects if it finds either: (1) That the only record linking the subject and the research would be the consent document and the principal risk would be potential harm resulting from a breach of confidentiality. Each subject will be asked whether the subject wants documentation linking the subject with the research, and the subject's wishes will govern; or (2) That the research presents no more than minimal risk of harm to subjects and involves no procedures for which written consent is normally required outside of the research context. (Consent form).

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval via an amendment. Additionally, all unanticipated problems must be reported to the USF IRB within five (5) calendar days.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

John Schinka, Ph.D., Chairperson USF Institutional Review Board

Appendix J. *Repertoire of the Choirs*

Nairobi Chamber Chorus (NCC) Repertoire

Contemporary Choral	**CCM Choral**	**Traditional Folk from Africa Choral**
United States of America National Anthem (F.S. Key, arr. Floyd Werle)	Say Something (arr. Charles Buzeleski)	Kingly (Traditional, arr. Stacy Gibbs)
	How Good (Michael Engelhardt)	Sigalagala (Sam Otieno)

Festival Singers of Florida (FSOF) Repertoire

Contemporary Choral	**CCM Choral**	**Traditional Folk from Africa Choral**
All Praise to Thee (Elaine Hagenberg)	I'm Building Me a Home (Anthony Trecek-King)	Tshotsholoza (Trad., arr. AV4P)
American Triptych (Come to the Woods) (Jake Runestad)	Don't Be Afraid (arr. Jennifer McMillan)	Ndikhokhele Bawo (Mzwandile Mabuza)
You Are Mine (Christopher Aspaas)	Long Time Traveller/Swing Low Sail High (arr. Evan Powers)	Akekho Ofana No Jesu (Trad., arr. Daniel Jackson)
Height in Heaven (Troy Robertson)		
Beloved, all things ceased (Tarik O'Regan)		

Appendix K. *Vocal training of Participants by Group*

Vocal Training of NCC Participants.

		Frequency (*n*)	Percent (%)
Early Voice Training	Had Singing Teacher When Began Singing	5	20
	Knowledge of Range & Tessitura	15	60
Formal Voice Training	None	11	44
	< 1 Year	9	36
	1-2 Years	2	8
	3-4 Years	1	4
	> 5 Years	2	8
Types of Voice Training*	Private	6	24
	Group	6	24
	Church/Community Choir	8	32
	School	12	48
	Home	1	4
	Peer	5	20
	Self-Trained	9	36
Current Voice Training	Currently in Voice Lessons	3	12
Warms-Up Before Singing	Never	0	0
	Almost Never	2	8
	Sometimes	11	44
	Almost Always	9	36
	Always	3	12
Years Singing in Formal Ensemble	<2 Years	2	8
	2-5 Years	7	28
	5-10 Years	13	52
	10-20 Years	2	8
	> 20 Years	1	4

*Was able to choose more than one
Note: NCC (*n* = 25)

Vocal Training of FSOF Participants.

		Frequency (*n*)	Percent (%)
Early Voice Training	Had Singing Teacher When Began Singing	40	58
	Knowledge of Range and Tessitura	66	96
Formal Voice Training	None	2	2.9
	< 1 Year	2	2.9
	1-2 Years	3	4.3
	3-4 Years	14	20.3
	> 5 Years	48	69.6
Types of Voice Training*	Private	65	94
	Group	24	35
	Church/Community Choir	33	48
	School	60	87
	Home	4	6
	Peer	13	19
	Self-Trained	33	48
Current Voice Training	Currently in Voice Lessons	7	10
Warms-Up Before Singing	Never	0	0
	Almost Never	6	9
	Sometimes	25	36
	Almost Always	36	52
	Always	2	3
Years Singing in Formal Ensemble	<2 Years	1	1.5
	2-5 Years	1	1.5
	5-10 Years	16	23
	10-20 Years	37	54
	> 20 Years	14	20

*Was able to choose more than one
Note: FSOF (*n* = 69)

Appendix L. Raw data, "How do you define healthy singing?" **How do you define healthy singing?**

Festival Singers of Florida:

- Supported singing, free sound
- Healthy singing involves low and free breathing on the inhalation; steady stream of air on the exhalation; "tension free" throat area (including tongue and jaw).
- Proper breath support. Minimal to zero jaw, tongue, neck tension. Highly resonant.
- Singing with the least amount of tension, relying on breath support, correct vowel and tone placement.
- Full tone, relaxed, supported singing
- Tension free with support coming from lower abdominal area.
- On the breath. Appropriate cord pressure.
- Singing with support that comes from the core and uses your entire body to resonate
- -supported by the breath and free of tension
- Relaxed and supported
- A free, relaxed sound
- Using breath properly. Drinking water. Not over-singing
- No tension or pushing to phonate.
- Free
- Supported by breath.
- Tension free with good breath control
- Well supported with low full breaths, relaxed jaw, resonation in the mask with good posture.
- Good breath support with no pain or tired sensations
- Full tone, lots of support, focused
- Balanced timbre of bright and dark, sustained breath flow and breath pressure ratio.
- Healthy singing
- Singing with the cords together with correct support and breath management. No tension in the body. Lifted soft palate when breathing and singing.
- Supported, free singing based on breath
- Producing sound without feeling any tension or causing any discomfort
- Free and natural
- Balance of air and muscle. Good resonance, lack of tension
- Freedom of time and expression without discomfort
- Well supported, open tone, sounds effortless, forward placement
- Tension free
- Freedom from tension, focused vocal folds
- Freely produced
- Using the right musculature and breath technique.

- Healthy singing comes from proper breath support, from your diaphragm muscles. I always tell my students that if your throat hurts more than your abdominal muscles do, you're doing it wrong. The Voice should be free to move about its range, without tension.
- Tension free, does not feel tight, breath used efficiently
- Free, natural, relaxed. Singing without tension. Not having to force it.
- Singing that is connected to the breath and which does not tire or damage the vocal cords
- Good use of breath, low larynx, no unnecessary tension in the face, in tune
- Singing in a way that does not hurt or cause damage to the muscles required in singing.
- Clean, not raspy
- Naturally generated phonation without forced pressure on the larynx
- Relaxed, clear tone, supported
- Proper use of breath and placement.
- Singing with proper and appropriate breath support.
- Singing with proper technique that does not damage the voice
- Free and vibrant (energized)
- On the breath, focused, resonant, and with an age appropriate tone.
- Clear tone, with breath support
- Singing that is well supported, that manages use of breath well and that sounds like your real voice.
- Healthy singing is tensionless singing, where no parts of the body are working against general function or health.
- Good breath support.
- Singing is healthy when it is produced through breath pressure, and there is little to no tension in the neck, mouth, and face.
- Tone that is on the breath in a resonant area with some sort of natural vibration of the vocal cords
- Singing is healthy when breath support and open resonating space is consistently used.
- Relaxation! And no pain
- Singing supported with proper breathing that does not strain the vocal mechanism.
- Round, clear sound, resonate
- Well placed and free of unnecessary tension
- Rich, warm, supported sound.
- Effortless, naturally produced, not strained or pinched, free flowing
- Supported singing from the intercostal muscles and the resonant cavity to avoid stress on the vocal folds
- Comfortable singing built on a foundation of supported breath and bodily involvement, without non-functional muscular tension, that can be sustained over time without damage (short-term or long-term) to the body or vocal mechanism.
- Full glottal closure with consistent steady breath
- Singing produced by a strong understanding of vocal technique.
- Free of tension following of breath
- Being able to produce a tone that is clear and audible without pain or struggle
- Free production and consistent tone throughout the range
- Powered by supported breath, resonance, freedom, flexibility in the tone.

Nairobi Chamber Chorus:

- Singing without straining.
- Singing well without having throat pains.
- Singing with ease with control over every aspect of your voice.
- How to take care of your voice
- Singing with the correct technique for the right amount of time and avoiding strain on the vocal folds. Knowing your limits and avoiding strain on your vocal folds.
- The kind of singing that does not make me feel overworked vocally.
- Healthy singing involves using your voice well and not straining it when singing.
- Healthy singing would be knowing your range and perfecting on it rather than straining outside your normal range. But at practice hours range expansion can be allowed.
- Singing comfortably in the right key without straining
- Not straining your voice.
- Ability to sing both in high and low register without vocally straining.
- Singing comfortably without straining your voice. Voice warming before singing.
- Using the right/proper singing technique and following proper protocol to take care of the voice when need be.
- Singing without constant vocal breaks or cracks.
- Classical technique
- Singing in my correct range after adequate warm-up. Also, to sing in good health (e.g. not when having a cold/sore throat).
- Being able to sing comfortably without straining your voice.
- Singing that does not cause strain or pain after a moderately long session.
- Singing in comfort a one maintains a good posture.
- Rich vocal tone, Clear diction, Power when require, wide dynamic range. Being able to control your voice to do what you ask of it.
- I define it as being able to use the right technique to sing so as not to hurt your voice.
- Singing without getting a sore throat
- Being able to sing without your voice getting hoarse

Appendix M. *Coding of "How do you define healthy singing?"*

1. Support
2. Free/Freedom
3. Descriptors
4. Low/Deep breath
5. Free breath
6. Airflow on phonation
7. No tongue tension
8. No jaw tension
9. No neck tension
10. Resonance
11. Vowels
12. Tone
13. Engaged core/abdominals/epigastrium
14. Body engagement
15. Relaxed
16. "Proper"/"Correct" with no description
17. Breath
19. Hydration
20. Not over singing/pushing
21. Mask
22. Posture
23. No pain/discomfort
24. No fatigue
25. Focused
26. Balance
27. Light/dark (Chiaroscuro)
28. Healthy
29. Vocal folds
30. Control/manage
31. Vocal fold pressure
32. Lifted soft palate
33. Sing/singing
34. Inhalation
35. Phonation/phonate
36. Feeling/sensation
37. Natural
38. Muscle
39. Time reference
40. Expression
41. Open
42. Timbre
43. Effortless
44. Placement
45. Technique
46. Diaphragm
47. Throat
48. Incorrect technique/doing it wrong
49. Range
50. Flexibility
51. No tightness
52. Efficiency
53. On the breath/connected to breath
54. No tension
55. No damage to vocal folds
56. "Good"/Appropriate/ well
57. Low larynx
58. No face tension
59. Intonation
60. Clean/clear
61. Not raspy
62. Generated
63. No force
64. Larynx
65. Vibrant
66. Energized
67. Age appropriate
68. Sounds
69. "Real" voice
70. Full body
71. Working against vocal function or health
72. Produced
73. Pressure
74. Mouth
75. General area
76. Consistent/consistently
77. Vocal mechanism
78. Round
79. Rich
80. Warm
81. No strain
82. Pinched
83. Stress
84. Comfortable
85. Foundation
86. Glottal closure

87. Knowledge
88. Ability
89. Audible
90. Struggle
91. Range
92. Powered by
93. Ease
94. How to
95. Care for
96. Voice
97. Knowing limits
98. Process of using voice/vocal production
99. Perfecting
100. In practice
101. Acceptable
102. Key knowledge
103. Register adjustment
104. Warm-up
105. Proper protocol for singing
106. Take care of the voice
107. Voice breaks/cracks
108. Classical
109. Good health
110. Clear diction
111. Power
112. Dynamic range
113. No sore throat
114. Hoarse
115. Ability

Appendix N. *Categories of codes for "How do you define healthy singing?" Manifestation of Vocal Issues:*

73. Pressure
107. Voice breaks/cracks
71. Working against vocal function or health
83. Stress
90. Struggle
82. Pinched

Negatively worded:
113. No sore throat
114. No hoarseness
61. Not raspy
54. No tension
91. No strain
23. No pain/discomfort
24. No fatigue
63. No force
20. Not over singing/pushing

Sensation of Healthy singing:
93. Ease
15. Relaxed
43. Effortless
84. Comfortable

Vocal Hygiene:
39. Time reference (longevity of singing)
104. Warm-up
19. Hydration
106. Taking care of the voice

Sound Production:
35. Phonation/Phonate
68. Sounds
62. Generated
72. Produced
33. Sing/singing
96. Voice

Vocal Mechanism:
57. Low larynx
86. Glottal closure
38. Muscle
64. Larynx

29. Vocal folds

Body Status:
14. Body engagement
13. Engaged core/abdominal muscles/epigastrium muscles
70. Full body
46. Diaphragm
22. Posture

Lack of tension:
9. No neck tension
47. No throat tension
58. No face tension
74. No mouth tension
8. No jaw tension
7. No tongue tension

Breath Intake:
26. Balance
52. Efficiency
4. Low/deep breath
34. Inhalation
5. Free breath
17. Breath

Breath management:
30. Control/manage
1. Support
53. On the breath/connected to breath
31. Vocal fold pressure
6. Airflow in phonation
92. Powered by
17. Breath

Resonance:
75. General area of resonance
32. Lifted soft palate
44. Placement
10. Resonance
21. Mask

General Musical Concepts:
11. Vowels
112. Dynamic ranges
59. Intonation
110. Clear diction

40. Expression
91/49. Range
102. Key knowledge

Tone Quality:
103. Register adjustment
67. Age-appropriate
80. Warm
60. Clean/clear
66. Energized
65. Vibrant
111. Power
50. Flexibility
42. Timbre
2. Free/Freedom
12. Tone
25. Focused
41. Open
79. Rich
69. “Real” voice
37. Natural
78. Round
27. Light/Dark (Chiarascuro)

Indication of training/baseline of knowledge:
105. Proper protocol
87. Knowledge
88/115. Ability
56. “good”/Appropriate/Well
95. Care for
36. Feeling/sensation
108. Classical
76. Consistently/consistency
28. Healthy
48. Incorrect technique/doing it wrong
98. Process of using voice/vocal production
77. Vocal mechanism
55. No damage to vocal folds
101. Acceptable
85. Foundation
45. Technique
97. Knowing limits
109. Good health
94. How to
16. “proper”/ “correct” with no description

In rehearsal:

99. Perfecting
100. In practice

Appendix O. *Music Teacher Interview Coding*

1. Affirmative, neutral responses
2. Current vocal status
3. Physiology
4. Vocal Fatigue/general
5. Value of singing in multiple genres
6. Vocal technique across genres (see 30)
7. Vocal technique in Classical/Bel Canto/"Legit" singing
8. Vocal technique in choral singing
9. Vocal technique in CCM genres
10. Vocal technique in Traditional World Folk Music/Kenyan
11. Authenticity
12. Versatility
13. Vocal fatigue in Classical/Bel Canto/"Legit" singing
14. Vocal fatigue in choral singing
15. Vocal fatigue in CCM styles/genres
16. Vocal fatigue in Traditional World Folk Music/Kenyan
17. Vocal Fatigue due to range/tessitura
    17a-High
    17b-Low
18. Vocal fatigue due to sustained pitches (see 65)
19. Straight tone
20. Vibrato
21. Leaps
22. Tone Quality/Timbre
    22a-Breathy (see 73)
    22b-Light (see 81)
23. Resonance
24. Ideal vocal technique
25. Weakness in personal vocal technique
26. Love of singing [genre]
    26W-Traditional World Folk
    26P-CCM
    26CH-Choral
    26BC-Classical/Bel Canto
    26A-All/general
27. Energy/vitality in singing Traditional World Folk
28. Loud dynamics (see 32)
29. Posture/alignment
30. Adapting vocal technique to genre/style (see 6)
31. Placement
    31a-Chest
    31b-Head voice
    31c-Forward
    31d-Belt
32. Vocal Health considerations in programming
    32a-Range
    32b-Tessitura
    32c-Sustained pitches
    32d-Chest voice
    32e & m-age consideration/appropriateness
    32f-Easy/free singing
    32g-Divisi
    32h & l -Styles/contrasting rep
    32i-Dynamics
    32j-Length of piece
    32k-Number of pieces/length of program
    32l-See 32i
    32m-See 32 e
    32n-Non-classical sounds (i.e. growls)
    32o-Western Classical
    32p-CCM
    32q-Preference
    32r-None
    32s-Key
    32t-Environmental
    32u-Overuse

32v-Misuse of voice
32w-Shouting (discourage)
33. Problematic genres for programming
33a-CCM (Pop)
33b & c-Specific composers
33d-CCM (Rock)
33e-None
34. Vowel modification/vowel unity
35. Breakdown or spiral curriculum to teach vocal technique
36. Comfort level of own vocal training (personal)
37. Using technical terms
38. Repetition
39. Breath support
40. Abdominal musculature support/core
41. Diaphragm
42. Bernoulli Effect or description of
43. Awareness of own vocal technique (personal)
44. Direct talk about the survey/bias because of survey
45. Voice gets better/feels healthier after singing for longer period of time (opposite of fatigue)
46. Voice felt healthiest after specific genre
46a-Choral
46b-Classical/Bel Canto
46c-CCM
46d-Traditional World Folk
47. Speaking voice impacts vocal quality
48. Teaching/Presenting/Projected voice
49. Voice issues (physiology and pathology)-SEE 3
49a-Inflammation
49b-Projecting voice/high volume (see 48)
49c-Pressing/heavy on voice
49d-Tension
49e-Breathing
50. Emotional connection to music
51. Music overtaking vocal health considerations
52. Group singing/collective-ness
53. Solo singing-SEE 96
54. Choral blending
55. Range and Tessitura
55a-Upper
55b-Lower
56. Connections between genres
57. Rhythmic elements
58. Teaching healthy habits
59. Intake of breath for singing
60. Passagio/Register adjustment
61. Fun!
62. Self-imposed vocal rest
63. Effort in singing
64. Pressed sound-SEE
65. Sustained singing-SEE 18
66. Shame (feeling)
67. Practicing unhealthy habits knowingly-SEE 51
68. Judgment/bias of vocal technique
69. Glottal attack
70. “Natural voice”/Easy singing
71. Musicianship
72. Following Conductor’s instruction
73. Breathy tone
74. Lack of thought on matter
75. Teach vocal technique specific to genres/style -SEE 30
76. Vocal health as a factor
77. Vocal health as a consideration (genre)
78. Censoring genres/styles because of vocal technique
79. Breath/Tone connection (singing on the breath)
80. Warming up (and effects of)
81. Lighter tone (SEE 22b)

82. Length of time/duration of singing
83. Vocal fatigue due to duration of singing
84. Western music/technique
85. Proper
86. No warm-up
87. Struggle of teaching vocal technique
88. Technique to extend range
89. Dropped jaw/space
90. Model technique
91. Imagery to teach vocal technique
92. Dynamics (SEE 28)
    92a-soft
93. Using voice to lead others
94. Rounded Voice/Vowel (Western Choral classical technique)
95. Tall Vowels/Closed vowels
96. Solo singing (SEE 53)
97. Open singing/open vowels
98. Personal voice training
99. Vocal hygiene principles
100. Doesn't teach voice
101. Environmental
102. Discussed with others
103. Personal benefits of singing multiple genres
104. Increased skills
105. Preference
106. Stability/being grounded/balanced (vocal technique)
107. Yawn sigh
108. Tension free
109. Diction
110. Phrasing
111. Texture
112. Uniformity of sound/blend (SEE 54?)
113. Acoustical singing
114. Singing outside
115. Training (SEE 98)
116. Learning by rote
117. Bad technique (SEE 68)
118. Intervals/Chromat-icism
119. Wider
120. Misunderstood concept
121. Cultural-Community differences
122. Talk about vocal health in teaching
123. Voicing considerations (SEE 32g)
124. Oversinging (SEE 32W)
125. Limit rehearsal time
126. Guest clinician/resource/culture bearers
127. Use of recording
128. Singing to impress

Appendix P. *Emergent Categories from Participant Interview Codes*

CCM:

9. Vocal Technique in CCM genres
15. Vocal fatigue in CCM styles/genres
26p: CCM
32p. CCM
33a. CCM (Pop)
33d. CCM (Rock)
46c. CCM
10. Resonance
21. Mask
70. "Natural Voice"/Easy singing (emic coding)

Choral:

8. Vocal technique in choral singing
14. Vocal fatigue in choral singing
26CH. Choral
46a. Choral
52. Group-singing/collectiveness
54. Choral blending
72. Following conductor's instruction
93. Using voice to lead others
112. Uniformity of sound/blend

Emotional Aspects of Singing:

26. Love of singing (genre)
    - 26BC. Classical/Bel Canto
    - 26CH. Choral
    - 26P. CCM
    - 26W. Traditional World Folk
50. Emotional connection to music
51. Connection to music overtaking vocal health considerations
52. Group-singing/collectiveness
61. Fun
66. Shame
105. Preference
128. Singing to impress

Folk and Traditional World Music:

10. Vocal technique in Traditional World Folk Music/Kenyan
26W. Traditional World Folk
16. Vocal fatigue in Traditional World Folk Music/Kenyan
17. Energy/vitality in singing Traditional World Folk
46d. Traditional World Folk

70. “Natural Voice”/Easy singing (emic coding)
121. Cultural Community differences

Musical Concepts:
21. Leaps
57. Rhythmic elements
65. Sustained pitches
71. Musicianship
92. Dynamics
    92a. Soft dynamics
    92b. Loud dynamics
109. Diction
110. Phrasing
111. Texture
118. Intervals/Chromaticism

Physiology and Pathology:
3. Physiology
32v. Misuse of voice
45. Voice gets better/feels healthier after singing for longer period of time
49. Voice issues
    49a. Inflammation
    49b. Projecting voice/high volume (see 48)
    49c. Pressing/heavy on voice
    49d. Tension
    49e. Breathing
62. Self-imposed vocal rest
99. Vocal hygiene principles

Programming:
32. Vocal Health considerations in programming
    32a. Range
    32b. Tessitura
    32c. Sustained pitches
    32d. Chest voice
    32e & m. age consideration/appropriateness
    32f. Easy/free singing
    32g. Divisi
    32h & l. Styles/contrasting rep
    32i/32l. Dynamics
    32j. Length of piece
    32k. Number of pieces/length of program
    32n. Non-classical sounds (i.e. growls)

32o. Western Classical
32p. CCM
32q. Preference
32r. None
32s. Key
32t. Environmental
32u. Overuse
32v. Misuse of voice
32w. Shouting (discourage)

33. Problematic genres for programming
    33a. CCM (Pop)
    33b & c. Specific composers
    33d. CCM (Rock)
    33e. None

123. Voicing considerations

Range:

17. Vocal Fatigue due to range/tessitura
    17a. High
    17b. Low
55. Range and Tessitura
    55a. Upper
    55b. Lower
88. Techniques to extend range

Rehearsal Techniques:

34. Vowel modification/Unity
38. Repetition
88. Techniques to extend range
90. Model technique
107. Yawn sigh
116. Learning by rote
125. Limit rehearsal time
126. Guest clinician/resource/culture bearer
127. Use of recording

Self-Awareness:

2. Current vocal status
24. Ideal vocal technique
25. Weakness in personal vocal technique
36. Comfort level of own personal vocal training
43. Awareness of own personal vocal technique
44. Direct talk about the study
68./117. Judgement/bias toward vocal technique

74. Lack of thought on the matter
98. Personal voice training
102. Discussed concept with others
103. Personal benefits to singing in multiple genres

Singing Across Genres:

5. Value of singing in multiple genres 6. Vocal Technique across genres
11. Authenticity
12. Versatility
26. Love of singing [genre]
    26A. All/general
30. Adapting vocal technique to genre/style
33. Problematic genres for programming

Singing Across Genres (con't):

    33a. CCM (Pop)
    33b & c. Specific composers
    33d. CCM (Rock)
    33e. None
46. Voice feels healthiest singing a specific genre
    46b. Classical/Bel Canto
56. Connections between genres
66. Shame
75. Teach vocal technique specific to genre/style
77. Vocal health as a consideration (genre)
78. Censoring genres/styles because of vocal technique
103. Personal benefits to singing in multiple genres
105. Preference
121. Cultural Community differences

Solo Singing:

53/96. Solo Singing

Speaking voice:

47. Speaking voice impacts vocal quality
48. Teaching/Presenting/Projected voice
49b. Projecting voice/high volume

Teaching:

35. Breakdown of spiral curriculum to teach vocal technique
58. Teaching healthy habits
75. Teach vocal technique specific to genre/style
76. Vocal health as a factor
87. Struggle of teaching vocal technique
90. Model technique

91. Imagery to teach vocal technique
100. Doesn't teach voice
116. Learning by rote
120. Misunderstood concept

Teaching (con't):

122. Talk about vocal health in teaching

Tone Quality and Characteristics:

19. Straight tone
20. Vibrato
22. Tone Quality/Timbre
    - 22a. Breathy
    - 22b. Light
31. Placement/Registration
    - 31a. Chest voice
    - 31b. Head voice
    - 31c. Forward placement
    - 31d. Belt
60. Passagio/Register adjustment
81. Lighter tone
73. Breathy tone

Vocal Fatigue:

4. Vocal fatigue/general
13. Vocal fatigue in Classical/Bel Canto/"Legit" singing
14. Vocal fatigue in choral singing
15. Vocal fatigue in CCM styles/genres
16. Vocal fatigue in Traditional World Folk Music/Kenyan
17. Vocal fatigue due to range/tessitura
    - 17a. High
    - 17b. Low
17. Vocal fatigue due to sustained pitches
63. Effort in singing
65. Sustained pitches
82. Length of time/duration of singing
83. Vocal fatigue due to duration of singing

Vocal Hygiene:

99. Vocal hygiene principles
101. Environmental factors
113. Acoustical singing without microphone

Vocal Loading:

32u. Overuse
49b. Projecting voice/high volume

49c. Pressing/heavy on voice
82. Length of time/duration of singing
83. Vocal fatigue due to duration of singing
125. Limit rehearsal time

Vocal Technique (General):

6. Vocal Technique across genres
7. Vocal Technique in in Classical/Bel Canto/"Legit" singing
8. Vocal Technique in Choral singing
9. Vocal Technique in CCM genres
10. Vocal Technique in Traditional World Folk Music/Kenyan
24. Ideal vocal technique
25. Weakness in personal vocal technique
30. Adapting vocal technique to genre/style
35. Breakdown of spiral curriculum to teach vocal technique
43. Awareness of own personal vocal technique
78. Censoring genres/styles because of vocal technique
84. Western music/technique
87. Struggle of teaching vocal technique
90. Model technique
91. Imagery to teach vocal technique

Vocal Technique- Best Practices:

23. Resonance
24. Ideal vocal technique
29. Posture/alignment
31. Placement/Registration
    - 31a. Chest voice
    - 31b. Head voice
    - 31c. Forward placement
    - 31d. Belt

32f. Easy/free singing
32f. Easy/free singing
39. Breath support
40. Abdominal musculature support/core
41. Diaphragm
42. Bernoulli Effect (or description of)
49e. Breathing
59. Intake of breath for singing
60. Passagio/Register adjustment
70. "Natural Voice"/Easy singing (emic coding)
79. Breath/tone connection; singing on the breath
80. Warming up
85. Proper
89. Dropped jaw/more space

106. Stability/Being grounded/balanced
108. Tension free

Vocal Technique Issues:
32u. Overuse
49c. Pressing/heavy on voice
49d. Tension
64. Pressed sound
67. Practicing unhealthy habits knowingly
69. Glottal attack
86. No warm-up
117. "Bad" technique
124. Over singing

Vocal Training:
24. Ideal vocal technique
36. Comfort level of own personal vocal training
37. Usage of jargon/technical terminology
76. Vocal health as a factor
98. Personal voice training
99. Vocal hygiene principles
104. Increased skills
115. Training

Vowels:
34. Vowel modification/Unity
94. Rounded vowel/Voice (emic coding)
95. Tall vowels/Closed vowels
97. Open singing/open vowels (emic coding)
119. Wider

Western Classical Vocal Technique:
7. Vocal Technique in in Classical/Bel Canto/"Legit" singing
13. Vocal fatigue in Classical/Bel Canto/"Legit" singing
26BC. Classical/Bel Canto
32o. Western Classical
46b. Classical/Bel Canto
84. Western music/technique