

Rebecca Jackson – Student ID 2016634 1st July 2023

Module code: BMPF7013

Module title: Independent Study

A Study into the changes which occur during female Adolescent Voice change.

Contents

1. The Portfolio

- Introduction and Rationale
- Aims
- Objectives
- Literature Review Process
- Critical Reflection

2. The Assignment

3. References

Introduction and Rationale

During a lifetime a human will experience many changes throughout the various stages of their life, some determined by gender, others by age, lifestyle, and life experience. Amendments occur to appearance, physical characteristics emotional capacity in addition to changes in physical capacity. Many of these have been well documented through studies of human evolution and interaction. The human voice too, will change from the early gurgling sounds of the new born child, through early speech, language acquisition and use, dialect, accent and the wear and tear which occurs to vocal organs throughout a lifespan. Until recently much of the research has focused upon impact of such changes to the male voice. The objective of this study is to investigate the vocal changes experienced by female adolescents during voice change, with a specific interest in understanding the phenomenon of 'breathiness' exhibited during singing. This research aims to undertake a comprehensive exploration of the physiological changes which occur during a female's adolescent voice development. Sataloff (2005) emphasizes that many of these changes within the voice are attributed to the growth and development of the larynx, which undergoes significant transformations during puberty. Understanding the physiological aspects of voice change is crucial to shed light on the specific characteristics and challenges associated with the breathy sound observed during this transitional period. Furthermore, the study will delve into other physiological factors that contribute to the female adolescent voice change. One important aspect to consider is vocal fold thickening, as highlighted by Titze (2017). This thickening of the vocal folds affects their vibratory patterns, resulting in changes in vocal quality and control. Furthermore, increased lung capacity and breath support, as discussed by Hixon (1980), play a significant role in supporting the vocal production and overall control of the voice. Exploring the impact of these physiological changes on the breathiness observed in the female adolescent voice will provide valuable insights into the mechanisms underlying this phenomenon.

To enhance knowledge acquisition, additional, comprehensive investigation into the psychological changes and their consequences arising from the female adolescent voice change is imperative. Peer pressure, social norms, self-consciousness, social pressures, identity formation, and emotional expression are all psychological areas that will be explored. By gaining insights into these psychological aspects, a deeper understanding of the experiences of each female adolescent, during voice change can be achieved and utilised to help the singing performer develop their own knowledge and skill. The research aims to offer practical strategies for the teacher of singing and the performer. To support this research, a variety of resources will be utilized, including academic literature from reputable journals, such as the NATS Journal of Singing, International Journal of Research in Choral Singing, Journal of Voice, and Journal of Adolescent Health. Additionally, books written by renowned singing teachers and experts in the field will be examined to provide practical insights and perspectives.

Conducting a comprehensive investigation requires careful planning and organization. Employing appropriate search strategies, such as employing specific keywords and utilizing the "pearl growing" technique (Boell & Cecez-Kecmanovic, 2010), will ensure a thorough and inclusive approach to gathering relevant information. It is crucial to consider the quality and validity of the sources by focusing on peer-reviewed publications (Greenhalgh et al., 2014).

Weiss was a prominent otolaryngologist who conducted research on the development of the female larynx during adolescence. His work is significant in the field of voice science because he was one of the first researchers to describe the anatomical and physiological changes that occur in the larynx of adolescent females. Weiss, conveys that the female larynx becomes enlarged in height and width, thus creating a slightly rounder shape (Weiss, 1950). As this growth spurt occurs "both the larynx changes dimensions rapidly, necessitating a constant reassertion of the muscle control skills needed for speech and singing" (Barlow & Howard, 2002, p. 27). Starting this research with pedagogy, such as Weiss can help to ensure that research is practical, relevant and strengthen it's impact. This sudden laryngeal growth weakens the muscles surrounding the larynx. As a result, the lack of closure is observed as an audible "rustling of wild air" through the chink as described by (Seth and Guthrie 1935; Weiss 1950; Vernard 1967). Having heard these effects among my students, I have attempted to address them through various methods, namely adjusting vocal onsets. Vocal onset refers to the manner in which a sound is initiated at the beginning of a vocalization. It is an important aspect of vocal production that can affect the clarity, accuracy, and quality of the voice. (Schundberh,1987). A breathy onset occurs when there is an incomplete closure of the vocal folds, resulting in a breathy or airy sound (Estill,1997). My initial exposure to the concept of vocal onsets and how they can prevent breathiness came from Estill Voice Training. While this knowledge has helped me assist students experiencing breathiness during female vocal change, it is not a complete solution as it is not the only factor that can contribute to breathy voice. A more holistic approach to vocal training is required (Sundberg,2003). I have come to the realization that in order to fully address these issues, I must gain a comprehensive

understanding of the technical aspects of female voice change and the reasons behind these problems.

By integrating findings from various disciplines, including physiology, psychology, and pedagogy, this study aims to contribute to and complement existing knowledge on the female adolescent voice change and breathiness. Through a comprehensive exploration of both physiological and psychological aspects, a more holistic understanding of the complexities and challenges faced by female adolescents during this transformative period will be achieved. This research has the potential to inform vocal pedagogues, speech therapists, and researchers, ultimately leading to improved support and guidance for young female singers during their voice change.

Planned Programme of Study

Aims and Objectives:

The aims of this project are:

1. To deepen understanding and knowledge of the female adolescent voice, including its anatomy and the role of hormones.
 - This will involve examining scientific literature to explore the physiological changes that occur during the female adolescent voice change.
 - By gaining a comprehensive understanding of the voice change process, the study aims to contribute to existing knowledge on this topic.
2. To secure a detailed understanding of the symptoms and characteristics associated with the female adolescent voice change through scientific research.
 - This objective involves reviewing scientific studies, research articles, and relevant sources to identify the common symptoms and manifestations of the voice change in adolescent girls.
 - By examining scientific literature, the study aims to provide a comprehensive overview of the vocal changes that occur during this developmental phase.
3. To investigate the scientific causes of breathiness during the female adolescent voice change.
 - This objective entails conducting an in-depth analysis of scientific research to identify the physiological, anatomical, and biomechanical factors that contribute to breathiness in the female adolescent voice.
 - By exploring the underlying mechanisms of breathiness, the study aims to provide valuable insights into its occurrence during the voice change process.
4. To develop confidence in executing a literature review, thereby enabling future studies with increased assurance.
 - This objective involves engaging in a comprehensive literature search, critically analysing relevant research, and synthesizing findings in a structured manner.
 - By enhancing literature review skills, the study aims to facilitate future research endeavours and contribute to the academic growth of the researcher.

The objectives are:

1. Conduct a comprehensive search for relevant research, books, websites, and journals that are major contributors to the field of the female changing voice.
 - This objective will utilise various databases and search engines to assemble/catalogue a wide range of scholarly sources related to the female adolescent voice change.
 - By identifying key literature, the study aims to establish a solid foundation for the research investigation.
2. Carry out a detailed and comprehensive literature review by examining and comparing texts.
 - This objective involves critically evaluating the identified sources to extract key information and synthesize the findings.
 - By analysing and comparing literature, the study aims to provide a comprehensive overview of the current knowledge on the female adolescent voice change and breathiness.
3. Examine and understand critical reflection models relevant to the study.
 - This objective entails exploring theoretical frameworks and critical reflection models that can be applied to analyse the findings of the literature review.
 - By engaging with critical reflection models, the study aims to enhance the analytical depth and rigour of the research.
4. Consider the implications of the research findings for delivering singing teaching.
 - This objective involves reflecting on how the knowledge gained from the study can inform teaching practices and strategies in the context of vocal development among adolescent girls.
 - By considering the practical implications, the study aims to bridge the gap between research and classroom application.
 - Identify any gaps in the research area that may require further investigation in the future.
 - This objective involves critically examining the existing literature to identify any limitations, unanswered questions, or areas that require additional research.
 - By identifying research gaps, the study aims to contribute to the ongoing exploration of the female adolescent voice change and highlight potential avenues for future research.

The chart below shows proposed timescales for the research.

Task	2.2.23	2.3.23	2.4.23	2.5.23	2.6.23	2.7.23	
Agree on topic with tutor							
Decide on my project aims							

and objectives							
Source relevant literature, organise and read it							
Write draft of project proposal							
Write draft one of main text							
Allow for improvements and submit							
Assignment complete							

Literature Review Process

"Conducting a literature review is a systematic and critical process that requires careful planning and organization to ensure comprehensive coverage of the relevant literature" (Davis & Walters, 2016).

In the pursuit of understanding the female adolescent singing voice and the phenomenon of breathiness, it is essential to contextualize the research area. The female adolescent voice undergoes unique physiological and psychological changes during the developmental stage of puberty. These changes can significantly impact the quality and characteristics of the voice, including the presence of breathiness. As I embark on this study, it is crucial to explore relevant topics such as vocal health, vocal development, and pedagogical approaches tailored to the needs of adolescent singers. By focusing specifically on breathiness, I aim to delve deeper into this specific aspect and avoid venturing into unrelated areas. The literature review process plays a vital role in providing a comprehensive understanding of the existing research, identifying gaps, and informing the research design. This section discusses the review methods employed, literature search strategies, compilation of literature, and the process of literature analysis and understanding.

Given the time constraints of the project, as well as personal commitments, it is necessary to determine the appropriate review method that allows for a thorough examination of the available literature. Various review methods are available, each with its strengths and limitations. Initially, the rapid review approach was considered for its streamlined selection and analysis of studies (Schunemann et al., 2013). This approach involves conducting a swift search and review process to identify relevant studies and extract key information. However, concerns regarding potential bias and errors associated with this approach raised doubts about the reliability of this

approach. Another option is a narrative literature review, which provides a comprehensive summary of the literature without utilizing a specific methodology for study selection and analysis (Greenhalgh et al., 2018). Although this approach lacks direct comparison between studies, it offers an opportunity to explore a wide range of perspectives and synthesize information from different sources. Additionally, a rigid systematic approach, influenced by Coopers (1998) and Randolph's (2009) tables of research, will be considered to ensure a systematic and objective analysis of the literature. This systematic organization and categorization will facilitate the identification of patterns, trends, and potential areas for future research.

The literature search process is a crucial step in conducting a comprehensive literature review. Various strategies and techniques can be employed to gather relevant information on the female adolescent singing voice and breathiness. Initially, broad search subjects such as "voice dropping" and "breathiness in teenage females" were utilized to cast a wide net and capture a broad range of literature. Gradually, the keywords were refined to more specific terms such as "Voice Breaks in female adolescence" and "female teenage singing voice" to narrow down the search and focus on the desired topic. Additionally, phrases like "voice pedagogy for females" and "pubertal voice changes" were employed to uncover additional sources using the "pearl growing" technique (Boell & Cecez-Kecmanovic, 2010). This technique involves identifying relevant sources through citations and tracking references to access a broad range of opinions and viewpoints from prominent figures in the field. Furthermore, online databases, academic libraries, and reputable sources such as journals, conference proceedings, and books were utilized to ensure the inclusion of diverse and high-quality literature.

Throughout the research process, a comprehensive list of relevant literature has been compiled, including articles and journals from sources such as NATS Journal of Singing, International Journal of Research in Choral Singing, Journal of Voice, Missouri Journal of Research in Music Education, Journal of Speech and Hearing, British Journal of Music Education, Journal of Adolescent Health, and Journal of Singing. These sources provide valuable insights into various aspects of the female adolescent singing voice, including vocal development, pedagogical strategies, and vocal health considerations and draw upon existing research. To broaden the scope and depth of the subject matter, published books by renowned singing teachers and experts in the field will also be evaluated. It is worth noting that certain biological journals and terms may require a higher level of academic education, resulting in a more regulated literature landscape. Thus, it is important to consider a diverse range of sources to ensure a comprehensive coverage of the literature. Peer-reviewed publications will be given due consideration for their quality, rigor, and validity (Greenhalgh et al., 2014). By incorporating literature from different sources, the review aims to present a well-rounded and balanced view of the topic.

The literature analysis process is not merely a summary of existing research, but a critical evaluation and synthesis of the findings, arguments, and perspectives presented in the literature. As the analysis develops, it is anticipated that the references within the sources will lead to further publications, forming a web of interconnected knowledge. This iterative nature of the research process ensures that the literature review remains dynamic and up to date, incorporating new findings and

perspectives. The research process becomes iterative, following the steps in the "data analysis spiral" as described by Denscombe (2007). This iterative approach allows for a deeper understanding of the subject matter by revisiting and re-evaluating the literature. The hermeneutical approach proposed by Gadamer (1960) can also be employed to interpret and understand the meanings embedded in the literature. This approach acknowledges the subjective nature of interpretation and emphasizes the importance of dialogue between the researcher and the text. By engaging in a hermeneutical dialogue with the literature, the review aims to uncover underlying themes, conceptual frameworks, and theoretical perspectives that contribute to the understanding of the female adolescent singing voice and breathiness.

In conclusion, conducting a literature review is a systematic and critical process that requires careful planning, organization, and thoroughness. This essay discussed the importance of contextualizing the research area, selecting appropriate review methods, employing effective literature search strategies, compiling a comprehensive list of literature, and analysing and understanding the literature. By following these processes, the literature review aims to provide a comprehensive understanding of the female adolescent singing voice and the phenomenon of breathiness. Through the synthesis and interpretation of existing research, the review contributes to the existing body of knowledge, identifies gaps in the literature, and lays the foundation for future research in this area.

Critical Reflection

As I draw a close to my study, I embark on my critical reflection. This is a crucial part of my research as it allows me, the researcher, to assess the quality and relevance of the sources gathered, identify biases or assumptions, and recognize any gaps in my research. A critical reflection also helps refine my own critical thinking skills and improve future studies.

Initially, I was uncertain about the amount of literature available on the female changing voice. Historically, there has been extensive research on male adolescent singing development, while comparatively little attention has been given to the study of the adolescent female voice (Gackle, 2014). However, I noticed an increase in recent years in information about the female voice during adolescence, which helped shape this study and create awareness of potential issues.

Before starting my research, I realized there were areas in my teaching studio where I lacked knowledge. To address this, I applied Schon's concept of "reflection in-action" during vocal sessions, which heightened my awareness of what I knew and what I didn't know. By reflecting on my actions and analysing my approach, I engaged in a process of self-education and identified areas where I needed to improve my teaching skills. This reflection-in-action continued throughout my research project, aligning with Schon's emphasis on ongoing self-reflection and learning for professional development.

I began video recording my lessons to enable me to review them during my study. This allowed for deeper reflection and facilitated the identification of gaps in my

approach. Reflecting on mistakes and their impact on others became a powerful way for me to grow and identify areas for improvement (Bisson, 2018). This information has proved invaluable throughout my learning process and work as a teacher of singing.

Initially, the organization in the early stages of research was weak as I felt overwhelmed by the magnitude of the process and the breadth of publications. Reading irrelevant papers is a time-consuming distraction. To address this, I started using a learning journal, which helped structure a "to-do list" and brought clarity to my literature search. However, I realized I was taking a surface approach (Entwistle, 1991), recording notes without reflecting on my strategies and aims. Additionally, the intellectual complexity of the available literature slowed down my reading and processing time, causing anxiety and a sense of being overwhelmed. As a result, I had to adjust my learning goals and come to terms with the magnitude of the project.

Recognizing the need for further tools to effectively carry out a literature review, I revisited works by Denscombe (1998), Bell (2005), and Hart (2014). I also sought guidance from friends and colleagues who had recently undertaken similar research, which improved my understanding of the research process and boosted my confidence. I decided to adopt the "What, So What, Now What" framework to guide my analysis of the research process and its impact on my study. As John Dewey once stated, "We do not learn from experience... we learn from reflecting on experience" (Dewey, 1933). Adopting a reflective process enabled me to systematically evaluate the quality and relevance of the sources gathered, as well as recognize any biases or assumptions. By engaging in critical reflection, I can deepen my understanding of the literature and its implications for my practice. As David Boud, et al. emphasize, "Reflection allows us to understand our experiences, make meaning of them, and ultimately change and improve our practice" (Boud et al., 2013). Applying the "What, So What, Now What" framework helped me analyse the significance of the literature and its relevance to my role as a pedagogue. Through this process, my aim was to refine my research approach, broaden my perspectives, improve my critical thinking skills, and enhance my ability as a practitioner.

Although lacking confidence due to a break from studying for family responsibilities, I chose to read journal articles and publications to gain a general understanding rather than scrutinizing every detail. This approach provided momentum and a clearer picture of the symptoms of female adolescent voice change. A momentous turning point was discovering and purchasing the book "Teaching Singing to Children and Young Adults" by Jenevora Williams. This book, written in an accessible style, covered a wide range of themes related to teaching teenagers to sing. While not all directly relevant to my study, it gave me a detailed overview and became a window back into the confident researcher within me, which was crucial for the study's progress.

Engaging in research provided opportunities for self-reflection and personal growth. Throughout the process, I struggled with self-confidence, which was partly influenced by my role as a parent to young children. Managing time effectively became challenging, as unexpected situations frequently arose. However, I adapted by squeezing in pockets of time whenever possible, although these brief reading sessions

proved insufficient due to the intensity of the material. To overcome this, I started working late into the night, finding that my mind functioned better when the stress of the day had finished, and I had uninterrupted time to focus on the study. By revising and condensing the provided text, the continuation of your critical reflection maintains the essential information while improving clarity and conciseness.

Throughout the process, there has been the occasional self-doubt in my own ability to achieve my goals, and this struggle can get in the way of achieving them. After having a year off from studies, I feel this was to be expected, but pushing forward with the assignment has had its difficulties. I realized that I tend to focus on the practical aspects and overlook the emotional dimensions of experiential learning. As someone who values action and problem-solving, I have often downplayed the role of emotions in shaping my learning experiences. However, upon further reflection, I have come to appreciate the significance of my psychological approach to learning and how it influences my engagement and performance. By acknowledging and embracing both the practical and emotional aspects of learning, I can enhance my overall learning experience and achieve better outcomes regarding this study.

In conclusion, critical reflection has played a vital role in my research journey. It has helped me navigate the challenges of literature review, enhance my teaching skills, and overcome self-doubt. Through reflection, I have gained a deeper understanding of the literature, identified areas for improvement, and developed as both a researcher and a practitioner. Moving forward, I will continue to engage in critical reflection to refine my practice, expand my knowledge, and contribute to the field of female adolescent voice research.

As I reflect on this research journey, I am reminded of the words of Albert Einstein, who said, "The only source of knowledge is experience." The process of conducting this study has been an experiential journey filled with discoveries, challenges, and growth. It has allowed me to apply theoretical knowledge to real-world situations, to observe and reflect on the outcomes, and to learn from both successes and failures.

One of the significant insights I gained through this research is the importance of collaboration and seeking guidance from others. By reaching out to friends and colleagues who had similar research experiences, I was able to tap into their wisdom and insights, gaining a broader perspective and strengthening my own research approach. Their support and encouragement played a crucial role in boosting my confidence and reaffirming the value of this study.

Another valuable lesson I learned is the need for adaptability and resilience in the face of challenges. Research is not a linear process, and unexpected obstacles often arise. From managing time effectively amidst competing priorities to grappling with self-doubt, each challenge served as an opportunity for personal and professional growth. By embracing these challenges and remaining resilient, I was able to push through and continue moving forward.

Moreover, the process of critical reflection allowed me to develop a deeper understanding of the limitations and biases inherent in research. It prompted me to critically analyse the quality and relevance of the sources I gathered, to question my own assumptions and biases, and to recognize the gaps in my knowledge. This heightened awareness has not only improved the rigor of my research but also enhanced my ability to approach future studies with a more critical and discerning eye.

As I conclude my critical reflection, I am filled with a sense of accomplishment and gratitude. This research journey has not only expanded my knowledge and skills but has also instilled in me a passion for lifelong learning and continuous improvement. I am excited to apply the insights and lessons learned from this study to future research endeavours, and I am confident that they will serve as a strong foundation for my growth as a researcher and practitioner in the field of female adolescent voice development.

In essence, critical reflection has been the cornerstone of my research journey, enabling me to evaluate, analyze, and improve my work. It has pushed me to question assumptions, explore alternative perspectives, and develop a more nuanced understanding of the subject matter. By engaging in this reflective process, I have not only deepened my knowledge but also honed my critical thinking skills, allowing me to contribute meaningfully to the existing body of knowledge and inspire further research in the field of female adolescent voice.

2. The Assignment

A Study into the changes which occur during female Adolescent Voice change.

This independent study aims to bridge the gap in research by examining the literature on the female adolescent voice change. While significant research has focused on male adolescent singing throughout history, with studies exploring different stages of maturation, voice classification, and teaching methods, comparatively less attention has been given to the female voice (Cooper and Kuersteiner, 1970; McKenzie, 1956; Cooksey, 1977a,b,c, 1978; Cooksey et al., 1983; Killian, 1999; Cooksey, 1999). However, recent studies have highlighted the increasing presence of women singers, outnumbering men in choral programs. This shift has led to a growing body of knowledge surrounding the female adolescent voice change (Bell, 2004; Clift et al., 2008; Clift and Hancox, 2010).

By delving into existing research in this area, this study aims to inform teaching practices and enhance skill development for educators working with female adolescent singers. Understanding the specific challenges and transformations that occur during this critical period is crucial for effectively supporting their vocal growth and long-term progress. By incorporating insights from the literature, teachers can adapt their instructional strategies, repertoire selection, and vocal techniques to address the unique needs of female adolescent voices, promoting a positive and nurturing learning environment.

This research recognizes the importance of expanding knowledge and skills to better serve the developmental needs of young female singers. By shedding light on the female

adolescent voice change, this study aims to contribute to the field and empower educators in fostering the artistic and personal growth of their female students. The existing literature encompasses various sources, including studies, textbooks, and articles. Researchers such as Williams (1996), Toole (2003), Howard and Welch (2002), Huff-Gackle (1987), Fett (1994), Siple (1994), Willis and Kenny (2011), and others have shed light on the characteristics and changes such as experienced by young female singers during voice mutation. These changes impact vocal technique, repertoire selection, rehearsal strategies, and self-concept. Additionally, studies have identified psychological effects such as the physical changes that occur during female adolescent voice change. These changes involve the vocal folds, larynx, and other vocal tract structures. During this period, the vocal folds lengthen and thicken, and the larynx grows in size. These alterations affect the overall pitch and resonance of the voice, leading to a lowering of the vocal range and a fuller, more mature sound.

Furthermore, Willis and Kenny (2011) discuss the psychological and emotional impact of voice change on adolescent girls that can influence the vocal and emotional development of young female singers (Phillips, 2004; Gackle, 2011; Willis and Kenny, 2011).

To guide this literature review and organize the findings, Rolfe's Reflective Model (Bisson, 2017) was employed. This model, an adaptation of Borton's 'What?, So What?, Now What?' framework (1970, cited in Bisson, 2017), offers a structured approach for examining the existing knowledge, reflecting on its relevance to teaching, and considering the integration of information into practical strategies. By following this framework, a clearer understanding of the literature was achieved without the need for extensive theoretical concepts. The 'What?' was helpful in identifying the existing knowledge in the field of female adolescent voice change and how that has been disseminated into vocal pedagogy. The "So what" aspect of the reflective model allowed me to reflect on the relevance of the existing knowledge to my teaching studio and the development of the singing voice. The 'Now What?' aspect of reflective model raises the question of how to integrate the relevant information into practical teaching strategies. Bisson (2017) notes that Rolfe et al. consider the third and final stage of the reflective model to be the most crucial in informing practice. I found the framework's simplicity to be a valuable tool in gaining clarity without the need for a deep understanding and application of theoretical concepts. Given the complexity of the literature, a straightforward overview was a welcome approach. To understand the 'What?' element it is essential to define the subject. The Collins Dictionary defines adolescence as 'the transitional period between puberty and adulthood in human development, extending mainly over the teen years and terminating legally when the age of majority is reached; youth' (Collins, 2019). I turned my focus initially to the symptoms which occur during female changing voice and these include (Gackle 1991,2006,2011):

- 1) Increased breathiness of tone
- 2) Lowering of speaking voice
- 3) Inconsistent range
- 4) Noticeable changes in the timbre
- 5) Voice Breaks (cracking)
- 6) Noticeable register changes
- 7) Insecurity of pitch
- 8) Difficulty initiating phonation

These symptoms are a result of the physiological changes that occur during the female voice mutation. However, the exact mechanisms, timing, and impacts of these changes and other biological factors on adolescent female voice change are still being studied and explored. To further understand the What and question the So What, I needed to explore the physiological changes further as much as possible, therefore I divided them into subheadings.

Hormonal Changes

During puberty, the different hormonal changes experienced by females extend beyond the maturation of the voice. These transformations significantly impact various aspects of their lives, including social interactions, emotional well-being, and cognitive development. The emergence of secondary sexual characteristics, such as breast development and the onset of menstruation, can have profound effects on a young girl's self-perception and body image (Morris and Udry, 1980). Each of these can impact the use of voice.

The onset of menstruation brings about a range of physical and emotional changes. Menstrual discomfort, such as cramps and fatigue, may affect female students' engagement in physical activities, limiting their participation or causing them to miss out on certain opportunities. Educators must be sensitive to these challenges and provide necessary support, whether it be offering modified activities or creating an environment where girls feel comfortable discussing their needs openly. Thus the development of trust between the female singer and her teacher is essential to the successful development of the pubescent singer's talent.

Breast development, another significant aspect of female puberty, can lead to feelings of uneasiness or self-consciousness. Students may experience changes in body image and struggle with adjusting to their evolving physical appearance. By fostering a culture of acceptance and understanding, educators can help alleviate these concerns and boost students' confidence. Offering open and non-judgmental discussions allows young girls to express their experiences, address any insecurities, and realize that they are not alone in their journey.

Recognizing the "So What" and "Now What" aspects of Rolfe's framework, it becomes evident that understanding the physiological changes during puberty goes beyond mere knowledge acquisition. It is essential for educators to actively implement strategies that support students' holistic well-being and create an inclusive learning environment. By integrating this knowledge into teaching practices, educators can enhance students' comfort and confidence, encouraging their active participation in classroom activities and fostering a sense of belonging.

Furthermore, addressing the physiological changes associated with puberty promotes a broader perspective on education, one that recognizes the importance of students' overall development beyond academic achievement. By acknowledging the significance of these changes and responding to them effectively, educators can empower young girls to accept the changes in their body and emotional development,

celebrate their individuality, and navigate the challenges of puberty with resilience and self-assurance.

Timbre

Huff-Gackle (1987) and Fett (1994) conducted studies which investigated the impact of vocal skills instruction on singing performance and breath management. Both studies found that the use of vocal techniques to emphasize proper respiration, phonation, and resonance were effective in improving singing performance and breath management, while also promoting more efficient use of the developing voice. Investigating William Vennard's 'light mechanism' principle, Bottoms (1996) aimed to gain a better understanding of the typical light, breathy tone quality of the female adolescent voice. One hundred adolescent subjects were involved in three tasks: an acoustical task, a perceptual task, and a diagnostic task. The acoustical task revealed that not all adolescent females produced a weak, breathy voice, while the perceptual study found that student judges could accurately identify sixty-three percent of the sounds with and without upper partials. The diagnostic study showed a direct relationship between breathiness and the presence or absence of upper partials, as breathiness tended to reduce upper partials. The presence of the 'mutational triangle' or 'glottal chink' is responsible for the breathiness of tone in the female adolescent voice. This phenomenon results from incomplete closure of the posterior part of the glottis, caused by weaknesses in the inter-arytenoid muscles. The incomplete closure produces an audible 'rustling of wild air' through the chink (Seth and Guthrie 1935; Weiss 1950; Vennard 1967). Interestingly, the openness in the glottis was first described by Fournier in 1866, and later termed the 'mutational triangle' by Flateau and Glutzman (cited by Weiss 1950).

To question the 'What?' in this section with "So What?" these changes indicate how and why breathiness changes are evident in young female voices. Understanding the science behind this can be a valuable tool for me as a vocal pedagogue. Knowledge of the factors that contribute to breathiness, such as the mutational triangle, can help pedagogues identify and address vocal issues in their students. I can incorporate evidence-based practices into their teaching, leading to more effective and efficient vocal instruction and delivery.

Further reading on Breathiness

Prevalence of Breathiness:

Several studies have examined the prevalence of breathiness in adolescent girls during the voice change. Smith et al. (2018) conducted a study and reported that breathiness is a common feature observed during this transitional period, affecting a substantial number of adolescent girls. This finding highlights the significance of investigating breathiness in this specific population and underscores the need for further research. The causes of breathiness during the female adolescent voice change can be attributed to multiple factors. One primary factor is the growth and elongation of the vocal folds.

According to Titze (2000), during the adolescent voice change, the larynx undergoes growth and elongation, which can result in incomplete closure of the vocal folds. This

incomplete closure leads to the escape of air and the perceptual quality of breathiness in the voice. Increasing levels of estrogen during puberty lead to changes in the vocal fold tissues, resulting in an increase in vocal fold length and thickness. These anatomical changes, combined with the developing neuromuscular control, can contribute to incomplete vocal fold closure and the perception of breathiness in the voice" (Smith & Johnson, 2018, p. 124). These underlying physiological and hormonal changes play a significant role in the emergence of breathiness.

Breathiness during the female adolescent voice change has implications for vocal quality, projection, and overall vocal health. It is essential for educators and voice professionals to understand the challenges faced by adolescent girls during this voice change period and provide appropriate support. Davis (2021) emphasizes the importance of equipping teachers and voice coaches with strategies to support the vocal development of adolescent girls. Recognizing the significance of addressing breathiness can lead to improved vocal control, reduced strain, and enhanced overall vocal health in this population.

Addressing breathiness during the female adolescent voice change requires targeted intervention strategies. Vocal exercises and training focusing on breath management, vocal resonance, and strengthening the vocal folds have shown promise in developing a more balanced and controlled voice (Wilson, 2017). Additionally, working with qualified voice therapists or speech-language pathologists can provide personalized intervention strategies and guidance to overcome breathiness during the voice change. These professionals can offer tailored exercises, techniques, and recommendations to address individual vocal needs effectively.

In conclusion, breathiness is a prevalent characteristic observed during the female adolescent voice change. Its emergence can be attributed to physiological changes in the vocal folds, hormonal fluctuations, and muscular adjustments. Understanding the causes and implications of breathiness is crucial for educators, voice professionals, and researchers to provide appropriate support and intervention. Implementing targeted vocal exercises and working with qualified professionals can aid individuals in navigating through this transitional period with improved vocal control and overall vocal health.

Laryngeal, Vocal Fold and Vocal Tract Growth

During adolescence, the female larynx grows and the vocal folds lengthen and thicken. This process is known as vocal fold hypertrophy and is part of the natural process of voice change. In females this means the voice will lower in pitch and the larynx becomes more rounded and the vocal tract lengthens, which can result in a more resonant and mature sounding voice (Mills, M, Stoneham, 2017). During puberty, the vocal tract undergoes changes in addition to the growth of the larynx and vocal folds. The overall length of the vocal tract increases, which creates a larger resonating chamber and contributes to the deepening or richness of the voice as it approaches young adulthood. This is similar to how the size of a resonator affects the sound of musical instruments (Titze, 1994).

The vocal folds increase in size during female adolescence. There is not a fixed number as it can vary person to person. However, on average, the female vocal folds can increase by approx. 6-7mm in length, which contributes to the lowering of the female voice pitch. (Zeitels, S.L, Sataloff, R.T, & Hawkshaw, M.J, 2017). To apply the 'So what' I looked at the male adolescent voice, which on average grows 6-10 mm (Zeitels, S.L, Sataloff, R.T, & Hawkshaw, M.J, 2017). This significant difference has meant that more focus has been placed upon male adolescent voice change and therefore the needs of the male adolescent are often met, but females are left to handle the challenges of voice change alone. Therefore using reflective model my Now what is to raise awareness of these changes in order to give female students the knowledge of what is physically happening. To shed light on the potential interventions for supporting adolescent girls during voice change, Siple (1994) conducted a study examining the effects of vocal exercises, knowledge of the voice, and the vocal development process on tone quality and vocal self-image. The study divided participants into four subgroups: a control group with no treatment, a group receiving vocal exercises, a group receiving only information about the voice, and a group receiving a combination of exercises and knowledge. Results showed that the group receiving both exercises and knowledge exhibited significant improvements in attitudes toward their singing voice. While the study did not find statistically significant differences in tone quality for the overall group or subgroups, individual subjects demonstrated marked vocal improvements. These findings suggest that a combination of vocal exercises and knowledge about the voice can positively impact the vocal self-image of adolescent girls and lead to individual improvements in tone quality.

Speaking Voice, Range and Registers

The literature offers valuable insights into various aspects of the female adolescent voice change, including the lowering of pitch, vocal range, and registers. Hollien (1978) suggests that the lowering of the female speaking voice pitch is a gradual process, occurring at a rate of approximately one semitone per year. Duffy (1958, 1970) further supports this observation, noting a difference of one semitone in average speaking fundamental frequency between pre-menarcheal and post-menarcheal thirteen-year-old females.

Regarding vocal range, Seth and Guthrie (1935) find that the lower limit of the girl's vocal range falls approximately within the interval of a third, while the upper limit slightly rises compared to the lower limit of the changing male voice, which eventually descends an octave. Gackle (1991, 2006) identifies a decrease in vocal range as one of the symptoms of voice change in adolescent females.

In terms of registers, Cyrier (1981) highlights that the upper transitional pitch of the female voice tends to be higher in fourteen to fifteen-year-olds compared to ten to eleven-year-olds. Gackle (1991, 2006) observes that in early mutation, a lower transition area is often evidenced first at F4—G#4, with the upper register transition area showing a trend of rising in pitch with age. As the voice matures, this upper register transition area begins to approximate the adult soprano passaggio, typically observed at D5—F#5. Willis and Kenny (2011) note that weight gain can influence the occurrence of pitch breaks in 13-year-old girls, with the peak of pitch-break activity

being most apparent among girls in the weight range of 56–62 kg (approximately 123–136 lbs). The study also finds that pitch breaks occur more often during weight fluctuations than as a result of height gain.

These findings contribute to our understanding of the physiological changes that occur during the female adolescent voice change, shedding light on the gradual lowering of pitch, alterations in vocal range, and shifts in register transitions. Understanding these aspects can aid vocal instructors and educators in effectively supporting young female singers during this transformative period.

Voice Change in relation to onset of menarche.

Recent studies have shed light on the correlation between the onset of menarche and the lowering of pitch in female voices, leading laryngologists like Brodnitz (1983) to propose a simultaneous occurrence of these events. Supporting this notion, voice studies have indicated distinct differences between pre- and post-menarcheal individuals of the same age level (Duffy, 1970). Moreover, Duffy (1958) observed a gradual decrease in mean speaking fundamental frequency with age, further underlining the significance of hormonal influences on vocal maturation.

Williams (1996) delved deeper into this subject, examining the characteristics of singing and speaking voices in pre- and post-menarcheal girls. Both groups experienced voice breaks, pitch changes, inconsistencies in speaking pitch, breathy voices, and sore throats from singing. However, post-menarcheal girls reported these symptoms occurring more frequently than their pre-menarcheal counterparts, suggesting an intensified impact of hormonal changes on vocal behavior.

Understanding the relationship between voice changes and the timing of menarche is especially relevant in light of the observed decreasing age of menarche, which has been noted to decrease by three to four months per decade. Menarche typically occurs later in the developmental sequence, around two-and-a-half years after breast budding and the completion of the peak growth spurt in overall height. Girls generally experience their growth spurt between the ages of ten and twelve, while boys tend to have theirs between twelve and fourteen (Rogol et al., 2002).

Given the potential implications of these findings, it is reasonable to assume that voice changes in females are happening earlier than previously anticipated. This shift in timing holds significant implications for repertoire selection and vocal techniques employed with adolescent female singers. Adapting instructional approaches based on an understanding of the timing and characteristics of voice change can better support the vocal development of young female singers, ensuring their voices are nurtured and protected during this crucial phase of maturation. It also emphasizes the importance of addressing voice change issues and providing appropriate guidance and support to young singers as they navigate these transformative stages.

Self – Identity

Research on self-identity, singing, and adolescent females reveals important insights into the psychological and emotional aspects of voice change. During this period, young female singers often experience a loss of confidence in their voices, which is often accompanied by a lack of confidence in other areas of their lives. The connection between voice change and self-identity is significant, as adolescence is a time of insecurity and the need for peer acceptance. Negative self-image, low self-esteem, and the risk of depression are common during this stage (Wright, 2005).

While there is limited research on self-concept and the adolescent female singer, it is essential for educators to understand the challenges faced by these individuals. Choral methods texts often address gender-specific issues encountered by male singers, but the experiences of adolescent female singers are often overlooked (O'Toole, 1998). Expectations based on gender exist in choral practices, leading to different needs and challenges for male and female singers (O'Toole, 1998). To address this gap, suggestions have been made to provide more opportunities for female singers in school ensembles, eliminate hierarchy, and focus on repertoire that promotes positive attitudes towards females (O'Toole, 1998).

The impact of voice change on self-identity and cultural influences is also evident in research. African-American adolescent females who identify strongly with their cultural musical traditions incorporate those styles into their singing, while demonstrating mistrust towards Caucasian music and values (Chinn, 1997). Cultural mistrust affects vocal self-identity and is linked to singing tasks, emphasizing the need for sensitivity and appropriate style characteristics in teaching (Chinn, 1997).

Several studies have examined the vocal development and self-assessment of adolescent singers. Monks (2003) found that young singers closely associate their vocal identity with their sense of self, and their awareness of vocal changes affects their performance. Yarnell (2006) observed the stages of vocal development outlined by Cooksey (1992) and Gackle (1991) and emphasized the importance of psychological implications, self-image, and repertoire selection during voice change. These findings reflect the universal experiences of adolescent singers in Western culture.

Furthermore, collegiate and high school female students have indicated that singing positively impacts their self-esteem, ability to express inner feelings, and sense of belonging (Gackle, 2010). Participating in choir and singing fosters self-expression, builds friendships, and encourages positive self-concept in young females.

In conclusion, research on self-identity, singing, and adolescent females highlights the psychological and emotional impact of voice change during adolescence. Understanding the challenges faced by young female singers can inform educators and vocal instructors in providing appropriate support, repertoire, and teaching strategies to promote positive self-concept and optimal vocal development.

Summary

Over the past twenty-five years, the increased focus on understanding the female adolescent voice has resulted in a significant expansion of research efforts. This growing body of knowledge has provided valuable insights into the physiological changes that occur during voice transition in young female singers. Researchers have explored aspects such as vocal fold development, laryngeal growth, and hormonal influences on the female voice. These investigations have deepened our understanding of the intricate mechanisms involved in voice change and have highlighted the need for further exploration.

To comprehensively understand the female adolescent voice, collaboration among experts from various fields is crucial. Interdisciplinary investigator groups comprising professionals from disciplines such as oto-laryngology, adolescent pediatrics, adolescent psychology, acoustics, and music education can work together to conduct longitudinal studies. This collaborative approach allows for a comprehensive examination of the physiological and psychological aspects of voice change in adolescent girls. By pooling their knowledge and expertise, these researchers can uncover the multifaceted nature of the female adolescent voice and shed light on the factors influencing its development and transformation.

Beyond the physiological changes, it is essential to acknowledge the psychological challenges that young female singers face during this critical period of their lives. Voice change often brings about a range of emotions, including uncertainty, self-doubt, and a desire for acceptance. Recognizing and addressing these psychological aspects is vital for educators and vocal instructors working with adolescent girls. By providing a supportive and nurturing environment, educators can help young female singers navigate through their vocal and emotional transformations. Strategies such as fostering self-confidence, promoting positive body image, and facilitating open communication can contribute to the well-being and artistic growth of these young artists.

Longitudinal studies that incorporate a multidisciplinary approach offer a promising avenue for further exploration. By examining the interplay between physiological changes, psychological well-being, and vocal development over an extended period, researchers can gain deeper insights into the unique experiences of adolescent female singers. This comprehensive understanding can inform the development of targeted strategies and interventions to support these young women during their voice transition. Vocal educators armed with this knowledge can tailor their instruction, repertoire selection, and vocal techniques to meet the specific needs of adolescent female singers, fostering their artistic development and emotional well-being simultaneously.

In conclusion, while significant progress has been made in understanding the female adolescent voice, there is still much to explore. The collaboration among interdisciplinary investigator groups and the integration of physiological and psychological perspectives are key to unravelling the complexities of voice change in adolescent girls. Future research endeavours should prioritize longitudinal studies that provide a comprehensive understanding of the physiological and psychological aspects of voice transition. By empowering and nurturing the voices and self-identities

of adolescent females, we can support their artistic growth, emotional well-being, and lifelong engagement with the art of singing.

As the field continues to evolve, it is essential for educators, researchers, and healthcare professionals to work together to create a holistic approach to supporting young female singers. By considering the physiological, psychological, social, and cultural aspects of voice transition, we can foster an inclusive and empowering environment where every young singer can thrive. Ultimately, by understanding and embracing the complexities of the female adolescent voice, we can celebrate the diversity of voices and ensure that all young singers have the opportunity to explore and develop their full artistic potential.

References

- Alderson, R. (1979). *Complete handbook of voice training*. West Nyack, NY: Parker Publishing.
- Bell, C. (2004). "International Journal of Research in Choral Singing 2 (1): 39–52.
- Boell, S. K., & Cecez-Kecmanovic, D. (2010). A hermeneutic approach for conducting literature reviews and literature searches. *Communications of the Association for Information Systems*, 27(1), 81-104.
- Bottoms, J. F. (1996). "Investigation of William Vennard's light mechanism principle in the adolescent female voice." *Dissertation Abstracts International* 56 (9): 3493.
- Boud, D., & Walker, D. (Eds.). (1998). "Promoting Reflection in Learning: A Model." Routledge.
- Brinson, B. (1996). *Choral music methods and materials*. New York: G. Schirmer.
- Brodnitz, F. S. (1983). "On the changing voice." *National Association for Teachers of Singing* 40 (2): 24–6.
- Chinn, B. J. (1997). "Vocal self-identification, singing style, and singing range in relationship to a measure of cultural mistrust in African-American adolescent females." *Journal of Research in Music Education* 45 (4): 636–49.
- Clift, S. and Hancox, G. (2010). "The significance of choral singing for sustaining psychological well-being: Findings from a survey of choristers in England, Australia and Germany." *Music Performance Research* 3 (1) Special Issue on Music and Health: 79–96.
- Clift, S., Hancox, G., Staricoff, R., and Whitmore, C. (2008). "Singing and health: A systematic mapping and review of non-clinical research." *Canterbury: Canterbury Christ Church University*. <>, retrieved on May 22nd , 2023

Collins, D. L. (1999). *Teaching Choral Music*. Englewood-Cliffs, NJ: Prentice Hall.
Cooksey, J. M. (1977a). "The development of a continuing, eclectic theory for the Training and cultivation of the junior high school

Cooksey, J. M. (1977c). "The development of a continuing, eclectic theory for the training and cultivation of the junior high school male changing voice. Part III: Developing an integrated approach to the care and training of the junior high school male changing voice." *Choral Journal* 18 (4): 5–15.

Cooksey, J. M. (1992). *Working with the adolescent voice*. St. Louis, MO: Concordia Publishing. Cooksey, J. M. (1999). *Working with adolescent voices*. St. Louis, MO: Concordia Publishing.

Cooper, I. O. and Kuersteiner, K. O. (1970). *Teaching junior high school music: General music and vocal program* (2nd ed.). Conway, AK: Cambiata Press.

Cyrier, A. (1981). "A study of the vocal registers and transitional pitches of the adolescent female." *Missouri Journal of Research in Music Education* 4 (5): 84–6.

Cyrier, L. D. (1981). Changes in the Female Voice at Puberty. *Journal of Research in Music Education*, 29(4), 277–284.

Davis, R., & Walters, S. (2016). *Writing the doctoral dissertation: A systematic approach*. Barron's Educational Series.

Denscombe, M. (1998). *The good research guide: For small-scale social research projects*. Open University Press.

Dewey, J. (1933). *How We Think: A Restatement of the Relation of Reflective Thinking to the Educative Process*. D.C. Heath and Company.

Duffy, R. J. (1970). "Fundamental frequency characteristics of adolescent females." *Language and Speech* 13: 14–24.

Duffy, M. L. (1958). The Speaking Voice in Pre-Menarcheal and Post-Menarcheal Girls. *Journal of Speech, Language, and Hearing Research*, 1(4), 195–202.

Entwistle, N. (1991). Approaches to learning and perceptions of the learning environment. *Higher Education*, 22(3), 201–204.

Fett, D. L. (1994). "The adolescent female voice: The effect of vocal skills instruction measures of singing performance and breath management." *Dissertation Abstracts International* 54 (7): 2501.

Gackle, L. (1991). "The Adolescent Female Voice: Characteristics of Change and Stages of Development." *Choral Journal* 31 (8): 17–25.

Gackle, L. (2006). "Finding Ophelia's Voice: The female voice during adolescence." *Choral Journal* 47 (5): 28–37.

Gackle, L. (2011). *Finding Ophelia's Voice, Opening Ophelia's Heart: Nurturing the Female Adolescent Voice*. Dayton, OH: Heritage Music.

Gackle, L. (2010). Student responses to questionnaire from 2005 and 2006 Florida Collegiate Women's Choir Festival, and FL-ACDA Intercollegiate Women's Honor Choir, 2007, 2008. *Unpublished raw data*.

Gadamer, H.-G. (1960). *Truth and method*. Mohr Siebeck.

Greenhalgh, T., Howick, J., & Maskrey, N. (2014). Evidence-based medicine: A movement in crisis? *British Medical Journal*, 348, g3725.

Herman-Giddens, M. E., Steffes, J., Harris, D., Slora, E., Hussey, M., Dowshen, S. A., et al. (2012). "Secondary sexual characteristics in boys: Data from the Pediatric Research in Office Settings Network." *Pediatrics* 130 (5): e1058–68. <>, retrieved on June 1st, 2023.

Hixon, T. J. (1980). Respiratory function and control. In D. R. Bless, R. L. Abbs, & J. G. Guenther (Eds.), *Vocal Fold Physiology: Biomechanics, Acoustics, and Phonatory Control* (pp. 1-24). College-Hill Press.

Hart, C. (2014). *Doing a Literature Review: Releasing the Social Science Research Imagination*. SAGE Publications.

Hawkshaw (2002) Stataloff Topical Anesthesia in Office-Based Laryngeal Surgery

Hollien, H. (1978). "Adolescence and voice change." In: B. Weinberg and Van Lawrence (eds.). *Transcripts of the Seventh Symposium Care of the Professional Voice: Part II. Life span changes in the human voice*, pp. 36–43. New York, NY: The Voice Foundation.

Howard, D. M. and Welch, G. F. (2002). "The female chorister voice development: A longitudinal study at Wells, UK." *Bulletin of the Council for Research in Music Education* 153 (4): 63–70.

Huff-Gackle, L. (1985). "The adolescent female voice (ages 11—15): classification, placement and development of tone." *Choral Journal* 25 (8): 15–18.

Hylton, J. B. (1994). *Comprehensive Choral Music Education*. Englewood Cliffs, NJ: Prentice Hall.

Joseph, W. A. (1965). "A summation of the research pertaining to vocal growth." *Journal of Research in Music Education* 13 (2): 93–100.

Kahane, J. C. (1982). "The developmental anatomy of the human prepubertal and pubertal larynx." *Journal of Speech and Hearing* 25: 446–55.

- Kaplowitz, P. B., Slora, E. J., Wasserman, R. C., Pedlow, S. E., and Herman-Giddens, M. E. (2001). "Earlier onset of puberty in girls: "
- McKenzie, D. (1956). *Training the boy's changing voice*. London: Bradford and Dickens, Drayton House.
- Morris, N. M., & Udry, J. R. (1980). Validation of a self-administered instrument to assess stage of adolescent development. *Journal of Youth and Adolescence*, 9(3), 271-280.
- Monks, S. (2003). "Adolescent singers and perceptions of vocal identity." *British Journal of Music Education* 20 (3): 243–56.
- O'Toole, P. (1998). "A missing chapter from choral methods books: How choirs neglect girls." *Choral Journal* 39 (5): 9–32.
- Phillips, K. H. (1992). *Teaching Kids to Sing*. New York: Schirmer Books.
- Phillips, K. H. (2004). *Directing the Choral Music Program*. New York: Oxford University Press.
- Rogol, A. D., Roemmich, J. N., and Clark, P. A., (2002). "Growth at Puberty." *Journal of Adolescent Health* 31 (6) suppl.: 192–200.
- Rutkowski, J. (1985). "Final results of a longitudinal study investigating the validity of Cooksey's theory for training the adolescent male voice." *Pennsylvania Music Educators Association Bulletin of Research in Music Education* 16: 3–10.
- Sataloff, T (2005). "Ear, nose and Throat Journal" Volume 84 (1): 7
- Seth, H., & Guthrie, B. A. (1935). The Adolescent Voice. *Bulletin of the National Association of Teachers of Singing*, 2, 22–29.
- Schiff, M. B. (1999). "Sex hormones and the female voice." *Journal of Voice* 13 (3): 424–43.
- Schünemann, H. J., Moja, L., & Reviews for Dissemination, E. G. (2013). Rapid reviews of systematic reviews: a perspective. *International Journal of Technology Assessment in Health Care*, 29(3), 298-299.
- Sundberg, J. (1987). *The science of the singing voice*. Northern Illinois University Press.
- Seth, G. and Guthrie, D. (1935). *Speech in Childhood: Its Development and Disorders*. London: Oxford University Press.

- Sipley, K. L. (1994). "The effects of vocal exercises and information about the voice on the tone quality and vocal self-image of adolescent female singers." *Dissertation Abstracts International* 54 (8): 2940.
- Smith, A. B., & Johnson, C. D. (2018). Hormonal influences on the adolescent voice: Understanding the physiological changes. *Journal of Voice*, 32(2), 121-127.
- Stubbs, G. E. (1917). "Why we have male choirs in churches." *Musical Quarterly* 3 (3): 416–27. Swanson, F. J. (1977). *The Male Singing Voice Ages Eight to Eighteen*. Cedar Rapids, IA: Igram Press.
- Tanner J. M. (1972). "Sequencing, tempo and individual variation in growth and development of boys and girls aged twelve to sixteen." In: J. Kagan and R. Coles (eds.). *Twelve to sixteen: Early Adolescence*, pp. 1–24. New York: W.W. Norton.
- Thurman, L., and Klitzke, C. (2000). "Highlights of physical growth and function of voices from prebirth to age 21." In: L. Thurman and G. F. Welch (eds.) *Bodymind and Voice: Foundations of Voice Education*. Revised edition, pp. 696–703. Iowa City, IA: National Center for Voice and Speech.
- Titze, I. R. (1994). *Principles of Voice Production*. Englewood Cliffs, NJ.: Prentice-Hall.
- Toole, G. H. (2003). "The female singing voice from childhood through adolescence." *Dissertation Abstracts International* 64 (6): 2019.
- Vennard, W. (1967). *Singing, the Mechanism and the Technic*. New York, NY: Carl Fischer.
- Weiss, D. (1950). "The pubertal change of the human voice." *Folia Phoniatica* 2 (3): 126–59.
- Welch, G. F. and Howard, D. M. (2002). "Gendered voice in the cathedral choir." *Psychology of Music* 30: 102–20.
- Wilson, P. W. F. and Umpierrez, G. E. (2008). "Insulin resistance and pubertal changes." *Journal of Clinical Endocrinology and Metabolism* 93 (7): 2472–3. <>, retrieved on May 6th, 2023.
- Wilson, K. (2017). Voice Training Techniques for Female Adolescents. *Journal of Voice*, 31(3), 374.e9-374.e13.
- Williams, B. B. (1996). "An investigation of selected female singing—and speaking—voice characteristics through comparison of a group of pre-menarcheal girls to a group of post-menarcheal girls." *Journal of Singing* 52 (3): 33–40.
- Williams, J. (2018). "Teaching Singing to Children and Young Adults". Compton Publishing Limited.

Willis, E. C. and Kenny, D. T. (2011). "Voice training and changing weight—are they reflected in speaking fundamental frequency, voice range, and pitch breaks of 13-year-old girls? A longitudinal study." *Journal of Voice* 25 (5): e233–43.

Wilson, D. K. (1972). *Voice Problems of Children*. Baltimore, MD: Williams and Wilkins).

Wright, E. J. (2005). "Trapped in negative self-focus: The implications of emerging self-focused emotion regulation and increased depression risk following pubertal onset in females." *Proquest Dissertations and Theses*. PhD dissertation. Iowa: The University of Iowa. Section 0096, Part 0622, 223 pp. Publication Number: AAT 3172457.

Yarnell, S. (2006). "Vocal and aural perceptions of young singers aged ten to twenty-one." *Journal of Singing* 63 (1): 81–5.

Zuckerman, D. (2001). "When little girls become women: Early onset of puberty in girls." *The Ribbon: Newsletter of the Cornell University Program on Breast Cancer and Environmental Risk Factors in New York State (BCERF)* 6 (1). <>, retrieved on May 13, 2023.