

Meg Bird

Student No: 2245846

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**The Vocal Register Quagmire: A physiological,
and psychological exploration of vocal registers
in adolescent, teenage girls
(with a focus on CCM).**

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The Vocal Register Quagmire: A physiological, and psychological exploration of vocal registers in adolescent, teenage girls (with a focus on CCM).

Introduction and Rationale

The quagmire of vocal registers feels an appropriate title for this area of research. Firstly, as a vocal coach working mainly with female, adolescent, students, navigation between head and chest registers often appears as a key issue. Personally, this was always an area of the voice I struggled with. Furthermore, my experience as a young singer still shapes my self-perception of my voice today. In my teaching, I am increasingly aware of the impact that singing in the 'foreign' register can have for my pupils. Often, singers will demonstrate great discomfort (both emotionally and physically) or avoid a register completely. Most commonly, it is the CT-dominant voice (head voice) that students struggle with. Consequently, they will remain in their TA-dominant (chest voice), straining to its maximum capacity, leading to a voice break. Students, therefore, appear to seem both resistant and insecure about moving within the higher spectrum of their range, limiting progress and expression. My experience, both as a singer and a vocal coach was validated in my most recent piece of research, which explored vocal coaches' attitudes towards their students' emotional wellbeing. Many teachers highlighted their students' insecurity when singing higher and spoke of an emotional block that inhibited their students when reaching for higher pitches.

Numerous sources within the literature cite how vocal registration is a difficulty for this demographic (Paul, *et al.*, 2024; Sweet & Cassidy Parker, 2018; Gackle, 1991). Due to the prevalence of this issue, I expected there to be a level of clarity and synthesis within the literature surrounding pedagogical approaches towards navigating the different vocal registers. However, my preliminary reading suggested that this isn't the case. This is partly due to the deficit of literature that focusses upon the female adolescent vocal experience; whilst there is a great deal of writing on the male voice, the female experience has, historically been somewhat neglected (Sweet, 2015). Furthermore, the focus on Contemporary Commercial Music (CCM) also narrows the literature spectrum. CCM was only identified as a pedagogical form in 2008 (AATS, 2014), meaning there is far less historical understanding, and exploration of the style, than its classical counterpart. Throughout the history of research within

vocal pedagogy, the controversy surrounding the topic of vocal registers is widely discussed (Blyskal, 2012; Herbst, 2020; Austin, 2004; Thurman, *et al.*, 2004; Hollien, 1974; Lehoux, *et al.*, 2024), and this is particularly the case when it comes to the CCM context in which there isn't a uniform, standardised pedagogical approach. It seems, therefore, that even within the field of research, this issue is considered a complex one; and thus, the quagmire metaphor continues.

I have been compelled to explore this issue from two angles. The first approach leans towards understanding the *physical* experience of the female adolescent student, whilst the second tends more towards an understanding of the *emotional* experience. I then hope to explore how these two elements impact each other.

The Physical

Within the ever-bourgeoning field of vocal pedagogy, there is a trend towards 'fact-based teaching', in which it is understood that an understanding of vocal biomechanics can enhance teaching practice (AATS, 2014; Ragan, 2018). This reflects my experience as a teacher. Largely, my understanding of the voice comes from how I was taught; I had singing lessons throughout my childhood and then studied Jazz Vocals with numerous teachers at a conservatoire. I had limited instruction on vocal biomechanics, and, therefore, my students receive little of that from me. Registration is one of the more common problems my students experience. Having a greater understanding of the biomechanics of this phenomenon, will help me move towards 'fact-based' teaching. No two voices are the same, and gaining a more thorough understanding of the vocal mechanism when negotiating the vocal registers, will give me the tools to develop different strategies, so that can respond to the different voices I am working with.

The Emotional

Evans and McPherson (2017) suggest that musical experiences during adolescence can have a life-long impact upon one's musical identity. Sweet and Parker (2019) echo the importance of the impact of a sense of vocal identity within female adolescents. They highlight four influencing factors that occur during vocal

identity development in teenage girls. One is the experience of “others as powerful influences” (p. 69); here, the opinions of others, including voice teachers, impacted their relationship with their voice. The desire to impress and perform for their teacher was strong. When students struggled, the lack of fulfilment became a source of stress for the student. Another factor that Sweet and Parker explored was the sense of “omnipresent emotions” (p. 72). Whilst there has been a great deal of research demonstrating the benefits of singing for wellness (Fancourt, *et al.*, 2015; Perkins, *et al.*, 2020), it is clear that, for outcome focused musicians, music lessons can be a source stress (Grape, *et al.*, 2003). Professional musicians are also cited to experience higher levels of emotional distress than the general population (Gross & Musgrave, 2016). The experience of teenage cis-females appears to be something of a microcosm of this experience. In Sweet and Parker’s (2019) case study on vocal identity development, their sample of this demographic demonstrated that pupils, not only gained feelings of pride and self-expression through singing, but also of “fear, insecurity, pressure, and anxiety” (pg. 72), as well as “frustration” (pg. 73). This suggests that management of the emotions that can arise from singing plays an important role within the work of vocal coaches.

Building a healthy attitude towards one’s voice feels important due to the intrinsic link between an individuals’ vocal identity and sense of self (O’Byrne, 2015). This is, perhaps, only exacerbated in young singers when considering the idea that “young singers have a musical instrument that reveals the changes that are taking place within them on a daily basis” (Monks, 2003, p. 243). For, not only are young people experiencing changes within their voice, but their lives a whole. Adolescence is a time of great commotion and change. When, as is the case for many young musicians, one is beginning to form an identity built upon the use of one’s voice, it seems natural that the inability to fully control that voice has a negative effect upon self-esteem (Wolfe, 2012; Sweet, 2015). The vulnerability of this demographic is further highlight by studies that suggest that teenage girls are at higher risk of Music Performance Anxiety and Perfectionism (between which a strong corelation has been identified) (Patston & Osborne, 2016), which demonstrates the care that is required when developing the young, female voice. The breathiness that is often experienced in the head register (Williams, 2025), and register breaks (Blyskal, 2012) are often cited as insecurities for this demographic (Williams, 2025).

The Whole

It is important to reflect upon the impact of these feelings within research, not only for the sake of student wellbeing, but because the experience of stress can have a negative impact upon the function of the vocal mechanism. My previous research has shown that stress, as an extreme result, can lead to voice disorders such as reflux laryngitis, granuloma, and vocal nodules (Swain & Pradhan, 2019) due to stress induced Laryngopharyngeal Reflux Disease (Hölmqvist Jämsén, 2019). Muscle tension can also occur as a response to stress (Çakmur, 2020) and this has been linked to voice disorders such as vocal nodules (Yosunkaya, 2021) and Muscle Tension Dysphonia (Hölmqvist, *et al.*, 2013). It seems clear, therefore, that emotional distress can impact the voice in the long term. This research aims to specifically explore if and how the feelings highlighted by Sweet and Parker (2018) can physically impact the vocal mechanism when exploring different registers and their transitions. I will also look to explore the emotional challenges that this causes, focussing on the relationship between a vocal identity, and self-efficacy within this demographic.

Research Aims

- 1) To evaluate the literature surrounding the general biomechanics of the different vocal registers.
- 2) To apply a fact-based teaching style when supporting students in navigating the challenge of registration. This is where voice teacher efficacy is achieved through integration of their experience and expertise *alongside* scientific research.
- 3) To analyse the challenges adolescent, female, students face, both emotionally and physically, when navigating the different vocal registers.
- 4) To investigate the relationship between the emotional and physical challenges faced by students.

Research Objectives

- 1) Develop varied and versatile strategies to support students in overcoming the challenges presented in the different vocal registers.
- 2) Continue to develop my practice as a holistic vocal coach, by further understanding how and why psychological factors can impact vocal output.
- 3) To contribute to the ever-burgeoning research field of CCM vocal pedagogy, as an advocate of the female adolescent voice.

My Research and its Philosophical Underpinnings

In this case, my research is rooted within Dewey's philosophy of 'experience' (Dewey, 2008; Morgan, 2014), in which research philosophy should become "rooted in life itself – a life that was inherently contextual, emotional and social" (Morgan, 2014, p. 1047). This feels highly relevant when researching within the field of vocal pedagogy, which is intrinsically scientific, artistic, performative and psychological in nature (Sell, 2016).

There is a pertinent parallel, here, between my own experience of research and my experience as a vocal coach. In his 'Concept of Experience', Dewey suggests that all experiences are linked to "an emotional, embodied element" where "feelings" play a role in linking an individual's beliefs to the consequential actions (Morgan, 2014). This resonates with me on two levels. Firstly, my experience as a teacher has shown that it is important to address vocal issues from a dual perspective. I have seen the impact that emotional aspects can have upon the physical voice production in several ways, both through my own previous research project (which explored vocal teachers' attitudes towards their student's wellbeing), and within the literature (Çakmur, 2020; Yosunkaya, 2021; Baker, 2002). It feels important, therefore, to explore both the physical, biological, and scientific experience *alongside* the emotional and psychological outcome of that experience.

This relationship with the teaching experience, in some ways feels like a microcosm of Dewey's 'Concept of Inquiry as a Basis for Research'. Here, there is a

constant process of reflection, solution-focussed questioning and actioning that takes place, with greater levels of attention. I feel that this process will provide the space for me, not only to gain greater understanding of the biomechanics of the vocal mechanism, but also to understand how the complexities of this instrument impacts the students' wider, holistic experience. As an insider researcher, I will be able to immediately action the results of my enquiry throughout this research process, which will further help develop my own beliefs and strategies to resolve the initial question at hand (Morgan, 2014).

Dewey's Reflective cycle (1910), as outlined by (Miettinen, 2000) (See Figure 1), Greenberger (2020) feels an apt framework for this review. Within this section, I have undergone the process of *suggestion* and early process of *intellectualisation*. I have identified an insecurity within my practice, and explored, and outlines the problem at hand. It is this process that has, in a way, helped me to identify my research aims and objectives. This process lays the foundations for critical enquiry and deliberate thinking. The following literature review will provide the backdrop for development of this process, with further *hypothesising* and *reasoning*. I will be continuing to teach as I undergo this process. Therefore, I will be able to *hypothesise in action* as I research – that is to test the ideas that I learn within this process in a real-life setting. This, in turn, will reveal further problems, and is where the process begins again. It is difficult, therefore, to remove myself from the process as a research-practitioner.

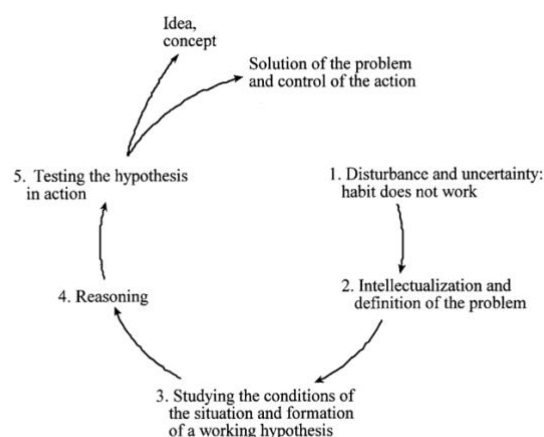


Figure 3. Dewey's model of reflective thought and action.

Figure 1 (Miettinen, 2000)

It feels appropriate, therefore, to also consider Hermeneutics within this backdrop. Both Dewey's system and Hermeneutics operate with an understanding of the dynamic process of research (Dallmayr, 2009). Within the hermeneutic tradition, reflection is considered central to the research process, and the researcher is not required to set aside their bias, but to recognise that this sits within their interpretation of the data (Winter, 2020). This resonates with my experience as an insider researcher, in which I am constantly interpreting and using the knowledge gained within my own teaching practice, throughout the research process. Furthermore, the focus of this review is to further my own understanding of this topic, in order to best serve my students. According to both Greenhalgh (2018) and Webber *et al.*, (2023) this is also the primary focus of a hermeneutic review.

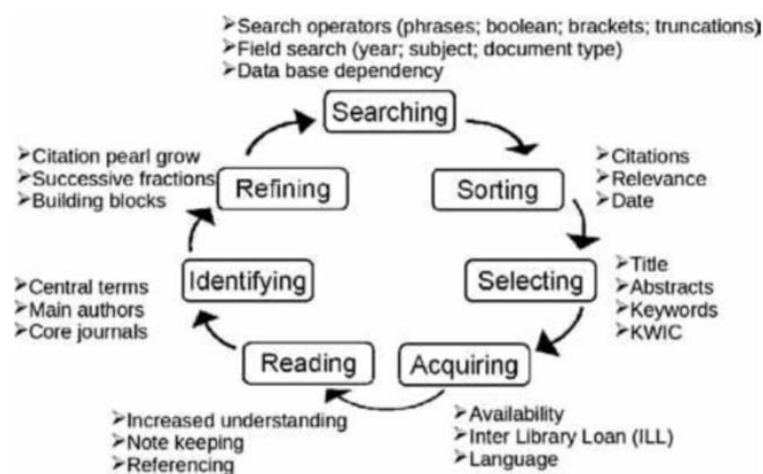
It is impossible to ignore, therefore, that I am approaching this topic with a great deal of bias. It is important, therefore, that my research strategy must take care to ensure that their research "is not just well-composed rhetoric of a well-meaning, but **biased**, researcher's opinion" (Thirsk & Clark, 2017). Galdas (2017) poses that this can be achieved through maintaining reflexivity throughout the research process. It has been argued that reflexivity is "essential for good qualitative research" (Braun & Clarke, 2013, p. 37). It involves demonstrating an awareness of oneself and one's position within the wider world and is particularly important to outline when your own experience is relevant to your research (Braun & Clarke, 2013). I will, therefore, maintain a research journal to hold myself accountable, and to reflect upon how I have come to know what I know, to ensure my report has credibility and trustworthiness (Watt, 2007).

Type of Literature Review

As Greenhalgh (2018) notes, many consider the narrative literature review style to be the "poor cousin" (p. 4) of the systematic review. A systematic review is certainly not deliverable within the scope of this assignment; I am acting as a solo researcher (systematic reviews require at least three researchers), and requires a more time than is at my disposal (Tulandi & Suarathana, 2021). A scoping review is often considered a pre-cursor to a systematic review (Tulandi & Suarathana, 2021). My preliminary reading suggests that there is great breadth to the literature surrounding my topic, particularly

when looking at the biomechanics of vocal registration, which would make a scoping review a suitable choice (Grant & Booth, 2009). However, the aims of a scoping review do not seem to align with my aims for this research. I do not seek to identify gaps in the research, or to understand the range, size or nature of the relevant literature to my research topic, as is the case with scoping reviews (Paré & Kitsiou, 2017). I am aiming to deepen my understanding of the vocal mechanism when singing in different registers, and to explore how this experience impacts adolescent, female voice students. My research question is rooted in my experience as a teacher, and I am arriving to this research with a clear bias. A narrative review gives me the space to gather and synthesise the literature around this topic “to demonstrate the value of a particular point of view” (Paré & Kitsiou, 2017, p. 161). In gaining a greater *understanding* of the problem, I believe the ability to help my students *resolve* the problem will be improved.

Literature Selection and Analysis



■ The hermeneutic circle of reviewing literature and techniques associated with different stages of the hermeneutic circle.

Figure 2, (Boell & Cecez-Kecmanovic, 2010)

Due to the philosophical underpinnings of this work, Hermeneutic Circling appears to provide a clear and thorough strategy for literature searching and analysis (see Figure 1) (Boell & Cecez-Kecmanovic, 2010). My initial reading has shown that

the literature surrounding this topic is dense, though there are few papers which directly address the issue at hand. I used the University of Wales, Trinity Saint David's (UWTSD) library search engine, Google Scholar and Chat GPT to identify literature within my initial reading. For Google Scholar, and UWTSD's search engine I used Boolean search filters, using terms such as "vocal registers AND adolescent females". The work of Bridget Sweet (2015) (2018), (and her joint work with Elizabeth Cassidy Parker (2019), and Lynne Gackle (1991) (2006) appeared to offer a great deal in terms of understanding the wider experience of adolescent females. However, these papers lacked the in-depth discussion surrounding the biomechanics of registration that I feel I need to fully gain an understanding of this topic. I therefore used Chat GPT to identify papers, published after 2020, that could offer a compressive explanation of the vocal register phenomenon. There are several issues when using ChatGPT within literature searches. Most notably, ChatGPT is not a reliable source for offering extensive lists of literature (Seth, *et al.*, 2025). However, when used *alongside* other search filters, including the UWTSD library search engine, and Google Scholar, triangulation is achieved. In this case, it did suggest Herbst's (2020; 2021) papers. After a thorough exploration of the validity of this paper, through forward chaining and reading, I concluded that Herbst's papers would be a valuable contribution to my understanding of vocal registers.

These essays, cited above, have become my *pearls* (Booth, 2008). Through *forward* and *backward* chaining, and 'related article' links, I have found further resources (Booth, 2008), and I hope, moving forward, this will mean I continue to find new search terminology (Hirt, *et al.*, 2024) to contribute to the dynamic nature of this research. I will continue to navigate through this process until I reach 'saturation point', the point at which I have found all the relevant literature to my topic (Ferrari, 2015).

Inclusion and Exclusion Criteria

Though the outlining of inclusion/exclusion criteria is not a requirement when writing a narrative literature review, it can help to maintain relevance and focus to the topic (Ferrari, 2015). It is widely acknowledged that it is important to be "up-to-date" with research, and some put greater value on more recent papers (Pontis, *et al.*, 2015). However, in this case, it appears that research from the 1980s still maintains a great

deal of relevance today. Therefore, I will triangulate this research with more contemporary studies and ensure that the research is still considered relevant through backward chaining of these more recent studies.

I will also be including Grey Literature within this research. Lawrence *et al.*, (2014) define this as evidence that sits outside of the tradition realm of scholarly literature that has been peer-reviewed, sits within an academic book, or journal. For the vocal coaches and practice-based researcher, many influential teachers (such as Jeanette LoVetri, Jo Estill and Janice Chapman) provide a foundational rubric for vocal pedagogy (Winter, 2021). Texts from such authors, therefore, can be considered relevant and credible sources, and will be used in this research. These include teaching manuals by Jenevora Williams (2025), Rodenburg (2015), Leborgne and Williams (LeBorgne & Rosenberg, 2026), and Hoch (2018). Dissertations and Conference proceedings are other forms of Grey Literature that will be used within this research (Kepes, *et al.*, 2012). This research focusses on CCM styles of singing. This is a relatively new field of research, having only been coined as a term within pedagogy in 2008 (AATS, 2008). Furthermore, there is limited peer-reviewed writing on the adolescent female demographic. Therefore, the use of dissertations have been included as they often add a great deal of insight into the specificities of the questions at hand.

Critical Reflection

I sit in a unique position within this research, as I have approached this topic both as a teacher *and* a learner. Both lenses require unique reflection as, within this process, I am looking for growth, not only as a teacher, but as a researcher. Driscoll's method (based on Borton's (1970) 'What? So What? Now What?' questions) encourages a thorough and practical reflection that looks beyond the catalytic event and encourages application of reflection within a wider context (Ryder & Downs, 2022). This seems relevant as I am not only reflecting upon the research process, but also upon how own practical application as a voice teacher.

What?

Understanding the biomechanics of vocal registration.

So What?

I approached this project with very little experience of biomechanical and acoustical research. I felt, therefore, that gaining a thorough understanding of the process of registration was the key to unlocking the wider questions when looking at my demographic. I struggled to find a balance within the “rigor or relevance” (Schön, 1983) dynamic and found myself in the trenches of scientific language and research, that went far beyond my fundamental understanding. I was motivated by the idea that the problem I was trying to solve was, inherently, a technical one, which, in turn, requires a technical solution (Scott, 2024). With hindsight, I question whether disproportionate energy was spent on gathering knowledge that was far beyond my remit given the time constraints surrounding the project, and my own pedagogical goals. I came to feel that having a thorough understanding behind the intricacies of the biomechanics and acoustics of registration would not directly impact my ability to help my students (Schön, 1983). There then began the process of analysing which information was relevant to my work as a vocal coach. It was when I began to explore the strategies behind vocal registration, particularly when looking specifically at the female adolescent demographic, that I was able to filter the information that was most useful.

Now What?

Within my wider research, I have an interest in exploring the bridge between the psychosocial and physical aspects of singing. All my papers within my masters have studied this in some way, and I believe gaining a greater understanding of this area will drastically enhance my practice as a holistic vocal coach (Sell, 2016). I am confident in my ability to analyse the literature that focusses on the psychosocial elements as this is in line with my previous undergraduate level academic writing. However, balancing my ability to understand the biological aspects of singing will give me a greater scope to explore how the two elements can impact each other. To do this, I need to ensure I have a greater understanding of vocology, acoustics and the

general biomechanics of the voice. Whilst I am a certified in Vocal Health First Aid, I believe expanding upon this through courses provided by the Voice Study Centre will be a positive step towards levelling up my scientific knowledge. This will be a challenge, given the workload of this masters, in combination with my other work commitments. It may be best suited, therefore, to set this as a long-term goal. Once my masters is complete, I can dedicate time to these courses. This will set a solid foundation for any future research I may undertake, whilst also developing my own teaching practice, and supporting a move towards fact-based teaching, in which pedagogical practices are rooted in science and research (AATS, 2014).

I have felt, within my own practice, that there is a shift towards a fact-based teaching style. Like many teachers, I rely heavily on the use of images to describe vocal technique (Morris, 2013). However, current thought within the research suggests that a synthesis of imagery, and physiological description, dependent upon the students technical and emotional readiness (Gullaer, *et al.*, 2009), best supports a student in technical development (Morris, 2013; Brown, 2025). I believe this research has brought me closer towards a balanced synthesis of this approach. I have noticed that a physical description of registration, alongside comparing the vocal folds to an elastic band for example, gives a clearer image to students. Furthermore, understanding the biomechanics has helped students to see that registration is not an immovable obstacle, but a physical challenge that can be overcome with time and effort. I will continue to promote my own learning, therefore, within this field to further support my students.

What?

Implementing strategies into my own teaching practice.

So what?

This was an incredibly interesting element of the research process. This gave me a unique view into how the psychosocial factors affect the physical factors of registration. For example, I read, early on in my research, that exercises that start higher in the head register, then work down into the chest register, are beneficial when trying to

blend the registers (Herbst, 2021). I therefore took this exercise into the studio. We did a thorough warm up using Semi-Occluded Vocal Tract Exercises (SOVTEs) and sirens. I then asked the student to sing a major, scalar pattern from E⁵ to A⁴ on a nasal, 'ee', sound. She refused, at first, to do it. She described the feeling of starting at that register to be too exposing. This was a common theme throughout the rest of the day with my other students. This experience was echoed within the work of both Sale (2022) and Blyskal (2012) who recognise the self-consciousness that is inherent within the female adolescent demographic. I came to realise that, in some ways, the technical approach, and the psychological needs of the students were at odds with each other. I also began to question whether I should push my students to try this technique, regardless of their emotional readiness, or whether I should try to protect them from feeling exposed and vulnerable, potentially damaging their psychological relationship with their voice.

Now What?

I am, often, working with outcome focussed students; students who want to improve their voice and meet achievements either through performance, grades, or recordings. Some aspire to enter the music industry. With these students I feel it is important to develop *hardiness*, in which challenge is perceived to be an opportunity for growth (Kobasa, 1979). Progress can be made more efficiently if students do not avoid these opportunities. However, I also recognise that there are ways to ease students into these more challenging, and exposing, exercises. After my initial experience with the student mentioned above, I decided to change approach. I took inspiration from Edwin's (1997) suggestion of using role-play within teaching practice to remove the pressure from technical exercise. It, perhaps, isn't appropriate to incorporate *play* in the same way with this demographic, as you might with a younger child, as is the case with Edwin's scenario. Therefore, I slightly changed the exercise, working down from E⁵ to C⁵. Instead of using an 'ee' sound, I asked the singer to start on a lip trill. There seemed to be little resistance to this. We then stayed within the same pitch range, and used different sounds that gradually evolved to the singing 'ah'. This worked on two levels. Firstly, the use of SOVTEs is noted within the research to help strengthen registration, improving vocalisation over the passagio and through into the head register. It also removed the exposing nature of singing in a part of the voice that is

less comfortable for the singer. After this encounter took place, I read the work of Manternach *et al.*, (2024) who suggested that straw phonation was the best form of SOVTE when dealing with registration. I currently mostly used lip trills of tongue rolls within my teaching and singing. Moving forward, I will encourage straw phonation more frequently within my technical and singing practice.

The exploration of a vicious cycle within the female adolescent voice has opened up new lines of enquiry for me. I believe a greater understanding of perfectionism within this demographic will bolster my grasp of the psychological elements at play for my students. Perfectionism has been linked with procrastination and avoidant behaviour (Çapan, 2010). Therefore, I question whether a stronger knowledge of the strategies to prevent and resolve perfectionism, may also directly improve a singer's ability to navigate registration. With hindsight, a more thorough examination of this may have been a relevant aspect to this research, however, I question whether it was in the scope of both the time scale and word count.

Part 2

Introduction

It is widely acknowledged amongst researches that issues surrounding registration are widely prevalent in adolescent, cis-female vocal students (Blyskal, 2012; Cobb, 2022; DeMaio, 2016; Gackle, 1991; Sweet, 2015). As the larynx grows, it becomes harder for the vocal folds to achieve complete adduction (Gackle, 1987) which causes breathiness in the tone. This is particularly prevalent within the 'head-register'. As the voice develops, the 'chest-register' develops in timbre due to the growth of the vocal tract. This contradictory development within the two regions of the voice causes a chasm between upper and lower pitches. Due to the popularity of CCM styles within popular media (Clement-Cortes, 2010), there is a tendency, amongst this demographic, to push the chest voice region to its threshold to the point of discomfort (Sale, 2022). This can lead to the register breaks that often characterise this demographic's singing. It is important, however, to look at this phenomenon holistically. There is an innate connection between the singer and the self at any age (O'Bryan, 2015; Monks, 2003). If there are vocal changes that occur due to maturation,

it is likely that any issues within vocal technique may have a direct link to a student's wellbeing. Studies have also shown, however, that poor emotional wellbeing can have a negative impact upon vocal function (Çakmur, 2020; Yosunkaya, 2021). This essay will aim to explore these links in greater detail, giving specific attention to registration.

Terminology and Nomenclature

Within the world of vocal pedagogy, the topic of registration is widely discussed, though rarely agreed upon (Blyskal, 2012; Herbst, 2020; Austin, 2004; Hollien, 1974; Lehoux, *et al.*, 2024). For example, there is great contradiction within the literature over nomenclature of registers. Historically, registers were labelled as “head”, “chest” and “mixed” registers due to their proprioceptive qualities (Garcia, 1847). However, many criticise this labelling because the head and chest are not the sound sources of these specific registers (AATS, 2014), and the proprioceptive experience of registration may vary from person to person (Herbst, 2020). In the late 1970s, a committee, formed to discuss Vocal Registers, developed a numerical system to combat the somewhat misleading nature of the head/chest terminology. However, this system hasn't become standard within pedagogical practices (LeBorgne & Rosenberg, 2026). To appropriately comply with a ‘fact-based’ teaching practice, functional terminology should be used (AATS, 2008). Thyroarytenoid dominant (TAD) and Cricothyroid (CTD) registers offer a description of the biomechanism of registers and are the AATS's recommended terminologies (AATS, 2014). Others use the terms Mode 1 (M1, chest) or Mode 2 (M2, Head) to categorise the different laryngeal positions during singing (Nelson, 2022). Integrating this terminology within my teaching will also initiate a discussion around the mechanisms of the voice with my pupils. This will benefit my practice, as studies have shown that vocal knowledge, when combined with vocal exercises, can reduce students' perception of tension when transitioning between low and high pitches (Siple, 1994). However, there is also something to be said for using the colloquial, and widely accepted terms within the industry (Nelson, 2022), with the caveat that these terms are not necessarily a precise description of the phenomenon (Herbst, 2020).

Registration in CCM

There is also variation within the literature depending upon genre and style. Within the research, there appears a slight bias towards classical techniques (Cobb, 2022). In 2008, the AATS recognised that much American music is inspired from the musical cultures of the global majority. Therefore, to focus solely upon western, classical technique was to diminish, and ignore, the validity of other styles (AATS, 2008). Often the TAD register sits at the heart of this contention. It is widely acknowledged, that within the CCM technique, vocalists lean towards TAD voicing (AATS, 2008; LoVetri, 2003). However, as late as 2016, the Royal Opera House launched a programme to combat, what they deemed to be, unhealthy singing styles, copying the “belting out” sound they were hearing on shows like The X Factor (Furness, 2018). There is also anecdotal evidence of the widespread belief that TAD voicing is in some way unhealthy and more likely to lead to vocal injury (Magid, 2023).

This suggests that, even now, many recognise Bel Canto as the “gold-standard” of teaching styles (LeBorgne & Rosenberg, 2026, p. 427), in which the TAD register is used sparingly (Hoch, 2018; Allen, 2004). Many papers that discuss the chest voice, warn against frequent use of the chest voice, suggesting that untrained singers who adopt the “pervasive” (Allen, 2004, p. 268) influence of contemporary styles are at risk of vocal pathology. There is an assumption, here, that this type of singing is inherently unhealthy, which is contradictory to preliminary studies surrounding the vocal health of CCM singers. Programmes, such as the one run by the Royal Opera House, for example, only perpetuate these myths about TAD singing causing vocal pathology (Edwards, 2018). This is perhaps because, within the American system, there are no doctoral degrees dedicated to CCM. Consequently, there is a barrier for highly qualified CCM performers, in gaining credibility through academic circles (Edwards, 2018). However, progress is being made and more recent studies are showing that CCM techniques and styles are not *wrong*, but *different*, and that registration is one of the key differences between the two styles (Bartlett & Naismith, 2020).

Within the world of classical pedagogy, vocalists aim towards one, clear, unified sound, where registers transitions are unperceivable and smooth (Leonard, 2004). However, for CCM singers, focus is more upon emotive expression. Often, register breaks, and variable tonal qualities are used to convey the vast spectrum of human emotion (Bartlett & Naismith, 2020). It is important to note that CCM is a blanket term that covers a breadth of musical styles, including jazz, pop, rock, and folk (Edwards & Hoch, 2018). The term, itself, was coined by LoVetri and Means-Weekly (2003) to replace ‘nonclassical’ styles. This, once again, demonstrates just how much musical ground is being bracketed into one style. Edwards and Hoch (2018), therefore, call for a more nuanced approach within pedagogy, in which each individual style is taught with the unique precision it deserves (2018). However, generalised titles such as ‘contemporary or ‘pop’ voice teachers are increasingly popular within school settings. It wouldn’t, perhaps, be practical to expect institutions to have a teacher for each genre, especially within the state school system, that has been subject to underfunding in recent years (Bath, *et al.*, 2020). Furthermore, adolescence is a time for exploration and discovery. Students may not want to bracket themselves into one specific genre at such a young age. A teacher’s role, therefore, is to guide them through this process by listening and expanding their horizons through the styles that both suit and fulfil them. This therefore means that teachers working within CCM must be *au fait* with registration techniques for several different styles.

The Biomechanics of Registration

To achieve this, it is important to have a strong, foundational understanding of the vocal mechanism. Historically, registration was evaluated against both proprioception and psychoacoustic perception (Henrich Bernardoni, 2006). However, by the mid 19th century, Garcia II had begun to define vocal registers as:

“a series of consecutive and homogeneous tones going from low to high, produced by the same mechanical principle, and whose nature differs essentially from another series of tones equally consecutive and homogeneous produced by another mechanical principle” (Garcia II, 1840, as cited in Henrich Bernardoni, 2006).

It is possible to see here, how a biomechanical element has been included within the discussion of registers. Whilst this component is widely discoursed within the literature to this day, the current, generally accepted definition of registration is credited to Harry Hollien (Herbst, 2020) who describes the phenomenon as:

“a series or range of consecutively phonated frequencies which can be produced with nearly identical vocal quality and that ordinarily there should be little or no overlap in fundamental frequency (f_0) between adjacent registers.” (Hollien, 1974)

In this updated definition, attention is also given to the impact of the resonance within the vocal tract (Herbst, 2020). Within contemporary styles, for example, this is the root of the desired “twang” that is used in the mixed register to blend the M1 and M2 zones and is an important element when belting (Nelson, 2022), which is a technique widely used within CCM.

Registration as a Laryngeal Phenomenon

In its simplest form, registration is controlled by two sets of muscles. The cricothyroid and thyroarytenoid muscles are an antagonistic/agonistic pairing (Nelson, 2022). When the TDs are dominantly used, a singer is said to be using chest register, and when the CTs are dominantly used, a singer is said to be using their head register (Herbst, 2020). The TAs sit within the body of the vocal folds themselves, and their role is, generally, to shorten and lengthen the vocal folds, creating nuanced and specific changes in pitch and tone. Conversely, the CTs sit on the posterior edge of the larynx. These muscles pull the thyroid cartilage forward and, in doing so, stretch the vocal folds, and increase pitch (Nelson, 2022; Thurman, *et al.*, 2004).

When using the chest register, (and therefore singing in lower pitches) there is little activity in the CT, whilst the TA is contracted and, therefore, more engaged, meaning it is produced in the M1 vocal mechanism (Roubeau, *et al.*, 2007). Here, the vocal fold *body* is firm, whilst the vocal fold *cover* is left relaxed. This creates a ‘mucosal wave’, adding an extra vibratory component that gives the chest register

the extra depth in timbre (Herbst, 2020). Furthermore, studies have shown that the activity of the laryngeal mechanism with the M1 register leads to a greater closed quotient (the period of time the vocal folds are shut within the vibratory cycle) (Herbst, 2020; LeBorgne & Rosenberg, 2026). When the vocal folds are open, important harmonics within the tone become dulled within the vocal tract (Herbst, 2020). When there is a greater time in the closed quotient, the harmonics are strengthened, which brightens the voice (Björkner, *et al.*, 2006). This 'bright' tone is often the desired quality within CCM music, and perhaps offers an indication into why so many CCM singers tend towards TAD singing.

The head register uses the M2 vocal mechanism (Roubeau, *et al.*, 2007). When singing in the head register, the CTs take over dominance, and the TAs relax, thinning the vocal folds (Henrich Bernardoni, 2006). The relaxation of the TA has two consequences. Firstly, the lengthening of the CTs lead to reduced closure of the vocal folds, as only the superior edges of the vocal folds achieve adduction, as opposed to the whole vocal fold cover (Herbst, 2020; Thurman, *et al.*, 2004). Secondly, the vocal folds themselves also become less dense due to the relaxation of the TAs which a reduced mucosal wave (Herbst, 2020). The challenge of complete vocal fold adduction when singing in the head register, accounts for the breathy and lighter quality of the head register. This difference in tone, especially for the untrained singer, can be drastic and perhaps explains why so many singers choose to avoid this region of the voice.

The Switch

As Herbst (2020) suggests, however, these two scenarios describe the vocal mechanism at "absolute antagonistic levels of engagement" (p. 184). He goes on to describe the region within the voice where there is an area of overlap, in which both mechanisms can be used, regardless of pitch. However, the gradual switch between the M1 and M2 mechanisms can be the cause of great difficulty, especially in young singers. This, perhaps, is due to the inclination within the vocal folds to remain within the existing vocal mechanism; as the singer ascends and descends in pitch, register transitions don't occur until the existing register can no longer facilitate the desired pitch (Roubeau, *et al.*, 2007; Herbst, 2020). Within CCM styles, there is a tendency

to favour the speech like, fuller tone that is heard so widely both on TV and social media, and this is certainly a style that is popular amongst younger singers (LeBorgne & Rosenberg, 2026). It is possible to see, therefore, why young, and untrained singers, may feel inclined to push their chest register beyond the point of comfortability, also causing vocal breaks (Sweet, 2015).

When a singer lacks the technique to gradually transition between the two registers, a “*bifurcation*” (Herbst, 2021, p. 354) occurs. This is when there is a quick and significant change in vibratory patterns, from one mode to the other. As Blyskal (2012) describes, the CT *thins and lengthens* the vocal folds to allow for an increase in pitch. Up to a point, the TAs can maintain thickness (or medial bulging (Herbst, 2020)). However, eventually, the TAs are forced to relax which causes a sudden shift in tone and timbre which characterises the ‘register break’. This can be a cause of great concern for the female adolescent singer, both technically, and therefore, emotionally (Sweet, 2015). Supporting this demographic in developing a strong and clear mixed voice appears to be of key importance in nurturing both a technically proficient and, consequently, confident singer.

The Mix

This region of the voice is, once again, an area of controversy. There does not appear to be a great deal of consensus within the literature over whether “the mixed voice” is a register within itself, or simply produced in the M1 or M2 mechanism with vocal tract, acoustic adjustments (Herbst, 2021). The latter argument was presented by Castellengo *et al.*, (2004) who argued that the measurement of the open quotient was a strong determinate of the vocal register being used. Their study suggested that the singer would use either the M1 or M2 mechanism, with vocal tract, acoustical adjustment to create the desired tone across the registers. This is a compelling study in so far as the results resonated with the experience of the singers themselves. However other, perhaps, more thorough studies have shown that there is unique laryngeal activity when singing in the mixed register (Kochis-Jennings, *et al.*, 2012) (Lee, *et al.*, 2021). Lee *et al.*’s., study, which focussed on CCM singers, however, describes the unique biomechanical, and aerodynamic qualities of the mixed voice. For example, in M1 singing, there is complete closure of the vocal folds, and in M2

singing, only the superior edges of the vocal folds close. In mixed register, however, there is only central closure of the vocal folds. Furthermore, the mixed register demonstrated the lowest Mean Flow Rate (in comparison to Chest and Head registers). This, perhaps, explains why SOVTEs have been so useful within my own teaching practice when working with singers in this area of the voice. SOVTEs allow for gentle, but complete, closure of the vocal folds, whilst allowing for low pressure, regulating airflow through the vocal tract (Titze, 2018). However, Lee *et al.*, (2021) also highlight the importance of further study of this register. There is a keenness, from young singers, to master this technique, but, perhaps, not the research to support vocal coaches in developing the strategies from a laryngeal perspective.

The “belting” phenomena only adds to this quandary. Whilst the assertion that the trend towards “belting” being a danger to the young voice is, perhaps, outdated, it is hard to ignore that it is a trend (Bartlett & Naismith, 2020). Within a musical theatre context, singers are now required to produce a belt-like sound up to F⁵, which is a relatively modern vocal requirement (Roll, 2016). Certainly, within the vocal studio, this is a sound that many young teenagers are keen to embrace. It seems that artists like Chappell Roan and Adele have come to define the popular standard of “good singing” amongst students; the release of films such as *Wicked* (2024), starring Cynthia Erivo and Ariana Grande, has only reinforced the idea that powerful belting equates to vocal excellence. However, belting is a complex vocal technique that requires a nuanced handling of both registration and acoustics. Some argue that belting is an extension of the chest register beyond its natural break (LoVetri, 2003). Whilst some singers feel this to be the case, it is more commonly acknowledged that belting is a blend of both registers (LoVetri, *et al.*, 2021). Wolfgang (2015) develops upon this perspective, suggesting that these perceptions are also valid belting techniques, in which the ‘pure chest voice’ technique is managed through a heavy mechanism (or the TA) and the mixing technique is managed through use of a lighter mechanism (engaging both the TA and CT). These differences in techniques perhaps reflect the diversity within the belting sound (Popeil, 2007). This may be due to the sense of “authentic expression” (LoVetri, *et al.*, 2021, p. 543.e20) at the heart of belting that drives the emotional impact for the listener. For younger vocalists, however, belting may not be the authentic tool; many of the techniques required to produce a healthy and strong sound are difficult for the adolescent female due to the ongoing changes within the voice (Wolfgang,

2015; Gackle, 1991). That isn't to say belting is a technique that can't be taught, but it certainly takes time to develop in the truest form for the singer (LoVetri, *et al.*, 2021). Exploring how emotions can be conveyed in a different, though genuine way, may build confidence in adolescent females as their ability to belt develops.

The Biological Context for Adolescent Females

There are several vocal changes that occur during female adolescence that negatively impact the voice, particularly when it comes to registration. These changes are outlined by Gackle (1991) who describes four stages of development (See figure 3).

Figure 3 – Stages of Development in Adolescent Females (Gackle, 1991)

Stage	Age Range	Vocal Characteristics	Register Breaks
Stage I	8–11 (Prepubescent)	Light tone, smooth register transitions, higher vocal range	Not specified
Stage IIa	13–14 (Early puberty)	Breathy tone develops, register breaks become more apparent. Clear contrast between breathy head and fuller chest voice	G4 to B4
Stage IIb	Around 14	Lack of tonal clarity persists, especially in the head register. Additional register break may appear	G4 to B4, additional break at D5–F#5
Stage III	14–15 (Young adulthood)	Increased range, tone becomes clearer, register transitions become smoother	Breaks still present but gentler

It has been widely cited that register breaks are a common technical challenge for the female adolescent singer (Paul, *et al.*, 2024; Sweet & Cassidy Parker, 2019; Gackle, 1991; DeMaio, 2016). The appearance of pitch breaks occurs regardless of whether a student receives voice training, which is perhaps an indicator that these are, in some ways, unavoidable, as they occur due to growth changes in the larynx (Willis & Kenny,

2011). This, perhaps, is important to bear in mind when working with this demographic. Assuring students that these breaks are not a permanent fixture of their voice, but temporary as their voice develops, may be reassuring to them.

This is also the case when considering breathiness in the voice. Breathiness occurs due to the *mutational chink*. This appears when growth within the laryngeal area causes incomplete vocal closure at the posterior end of the vocal folds, meaning the vocal folds do not achieve complete adduction (Gebhert, 2022). When considering this information, with the general understanding of the laryngeal mechanisms during registration, it follows that the breathiness is more acute during head register phonation. During CTD singing, there is already less vocal fold closure, and a reduced CQ. The addition of the *mutational chink*, therefore, will only contribute to the increased breathiness in this region of the voice.

The Psychological Context

Life as a Teenage Girl

It is widely acknowledged within both popular discourse that we are living through a period of great uncertainty politically, environmentally, culturally and economically. In the past five years, many teenagers, have lived through a pandemic, two significant wars, and clear evidence of climate crises. These concerns can have a direct impact upon mental health (Di Quirico, 2023), and it is, therefore, little surprise that experiences of poor mental health are increasing nationwide (Proto & Quintana-Domeque, 2021). However, young women appear to experience this more acutely with recent studies showing that 27.2% of young women (aged 17-22) had experiences of poor mental health (Stentiford, *et al.*, 2023). Firstly, the rise, and reliance, of social media has contributed to the exacerbation of body image pressures on female teens (Choukas-Bradley, *et al.*, 2022). Furthermore, Stentiford *et al.*, (2023) linked high levels of emotional distress to academic pressure, that stemmed, not only from familial expectation, but from within competitive school cultures. Perhaps the research that demonstrates higher levels of perfectionism with female adolescent musicians (Patston & Osborne, 2016) is a microcosm, or result, of this wider phenomenon. As

Paul *et al.*, (2024) describe, there are also higher rates of Music Performance Anxiety within this demographic.

For musicians of any age, self-perception is often interlinked with their voice (Baker, *et al.*, 2022; O'Bryan, 2015). Monks' (2003) study into young peoples' relationship with their voice revealed some interesting points. In her case study, it became clear that participants had a real desire for vocal improvement. They looked for clear guidance to achieve a peak performance, not for the sake of others, but for their own pleasure. This suggests that there is a link between the voice and the self. This is further explored by Sweet (2015). In her case study, vocal lessons and choir rehearsals had a direct correlation to participants' emotional state. When they sung well, there were feelings of pride. However, when they struggled with certain techniques, feelings of shame and frustration were experienced. For this population, the "ego" can be quite sensitive (McRoy, 2011). Vocal coaches must, therefore, deliver feedback with care, as receiving feedback can be a real challenge for some young people (Monks, 2003). This is particularly important when considering the impact a vocal coach can have upon the student's musical identity (Sweet & Cassidy Parker, 2019).

The Psychological Implications and Consequences

Numerous studies have shown the links between poor emotional wellbeing and vocal pathology (Yosunkaya, 2021; Çakmur, 2020). It is important, therefore, to explore whether the complexities surrounding registration are compounded when considering the psychological factors that are also at play. Blyskal (2012) articulately describes some of the psychological processes that occur when this demographic tackles the issue of registration. In this instance, psychological factors can be a motivator for potentially bad habits. Teenage girls want to assert themselves and demonstrate power and maturity, finding confidence in their new ability to "sing like a woman" (Sweet, 2015, p. 84). Within the head voice, however, there is perhaps, a perceived sense of weakness (Blyskal, 2012). During adolescence, it is natural for there to be a breathy quality to the head register (Gackle, 1991). So, when girls are comparing themselves to the voices they hear on streaming platforms and popular media (Clement-Cortes, 2010), they are holding themselves to unfairly high standards.

Blyskal (2012) goes on to recognise the self-consciousness of teenage girls. This is further explored in Sweet's phenomenological study. Not wanting to 'stand out' appeared to be a theme within her sample. Both authors suggest that pupils, therefore, actively avoid this area of their voice. Some will ignore the head register completely, whilst some will push the TAD voice to the point of pain and fatigue to achieve higher pitches (Sale, 2022). This suggests there is a level of excessive TA dominance which can limit vocal range, cause a pressed tone, and reduce the ability to mix and blend both registers (Herbst, 2020). This only succeeds at compounding the problem at hand. Many recommended, therefore, technical practice of both the head and chest register, building strength in both areas, in order to build a smooth transition (Herbst, 2020; Blyskal, 2012; Williams, 2025). This advice, though useful for technical development, fails to acknowledge the psychological factor of avoidance that is at play here. When teaching, there is often a visceral response from students when you ask them to begin singing at higher pitches. The fear of judgement, particularly felt within this demographic (Sweet & Cassidy Parker, 2019) may be a cause of this. This should be considered by vocal pedagogues working with this population.

There are also some biomechanical implications of stress/anxiety when changing vocal registers. Studies have shown in speech, that subglottal pressure is increased in individuals with anxiety (Özseven, *et al.*, 2018). However, in smooth register transitions, a skilful, and gradual change in subglottal pressure is required (Herbst, *et al.*, 2015). In an anxious state, controlling this may prove more challenging. Furthermore, increased subglottal pressure can have a prevailing impact upon vocal fold adduction and contact pressure (Zhang, 2021). This, in itself, can lead to vocal pathology, but when considered in relation to vocal registers, there is also a unique implication. The transition from chest to head register is the most common, and challenging, transition for adolescent females (Blyskal, 2012). The head register requires light contact and low tension. If there is anxiety induced, hyper-adduction, and increased subglottal pressure within the larynx, it is likely that register transitions will be abrupt.

It appears, therefore that there is something of a vicious circle at play. The natural impact of growth in teenage girls (Gackle, 1991; Gackle, 1987) causes issues within the voice that lead to uncertainty and insecurity (Sweet & Cassidy Parker, 2019). In

some, this leads to avoidant behaviour (Blyskal, 2012) which exacerbates the problem at hand. This raises questions for vocal pedagogues. Thorough practice in both registers is required to build a bright, and consistent tone across the whole range of the voice (Herbst, 2020). How can teachers manage the emotional resistance that may come when asking students to go beyond their comfort zone?

Strategies

Despite the lack of cohesion within the anatomical discussion surrounding the mix registers, there are some strategies towards building strength across the registers. Consideration must be taken, however, not to push the voice beyond its natural limits. Some authors recommend soft singing across the range to help blend the heavier chest, with the softer, head register (Herbst, 2021; Cobb, 2022). As previously mentioned, beginning softly, at higher pitches and working down, extending the head register as low as possible will, in the long term, contribute to building a mix (Herbst, 2021).

Vowel sounds should also be a consideration (Cobb, 2022; Magid, 2023). CCM singers should generally aim towards the bright vowel sounds (nay, gee are examples of this (Magid, 2023)). Cobb (2022) and Magid (2022) accurately outline the difference between *bright* and *dark* vowels, and the impact they have upon vocal quality. Bright vowels occur when the corners of the mouth are drawn (a “smiley” (Cobb, 2022, pg. 28) shape). This reduces the size of the vocal tract and aids with projection in higher frequencies, whilst reducing breathiness. Darker vowels are more commonplace within classical singing as they can enhance amplification, though they often change the quality of the word making them harder to understand, which is contrary to what is needed in CCM singing. Vocal coaches can then focus on *Open/Closed* vowels. The use of *open* vowels (such as *ah* and *oh*) are useful for developing the chest register. *Closed* vowels (such as *ee* and *oo*) are beneficial for practicing the head register. Descending *glissandos* using these vowels are also a good way to strengthen the head register region (Asztalos, 2022).

However, studies have shown that, vowel-based exercises, while somewhat beneficial, are not as effective as SOVTEs in counteracting the vocal impact of

maturation (Manternach, *et al.*, 2024). Manternack *et al.*'s., study is highly relevant to this research as it also focusses on adolescent female students. This research was significant on two counts. Firstly, participants who engaged in straw phonation showed a trend towards acoustic improvement. Secondly, and perhaps most notably, participants who engaged in straw phonation *felt* that there was a level of acoustic improvement when using straw phonation. As the researchers point out, this may have a positive effect upon the negative psychological impact of voice change in this demographic.

When looking at strategies to support this population in navigating registers, the strategies that positively impact the relationship voice feel important. More studies such as Maternack *et al.*'s., are required to develop more approaches towards blending the registers in the CCM style. Furthermore, the adoption of *holistic* style of teaching feels relevant here. Chapman and Morris (2023) talk of creating a space in which there is an openness of dialogue surrounding emotions, where it is felt that, in order to master the full palette of the voice, one must understand one's own internal, emotional map. There must be a relationship of trust between the student and the teacher, allowing the student to feel that they are safe to verbalise and express themselves, without fear of judgement (Jones, 2004).

Conclusion

Registration has long been a topic of great contention amongst the literature. Differences in styles, gender, ages, biomechanics and acoustics have been debated throughout research. It is clear that, particularly within CCM, more research can be done to gain a more thorough understanding of the topic, particularly with reference to this demographic. Overall, this research has shown that the issue of registration, with reference to this group, is due to the maturation of the voice. Whilst there are some strategies, such as SOVTE (Manternach, *et al.*, 2024), and soft singing (Herbst, 2021) that can help reduce these symptoms (breathiness in the head register, and voice breaks between the transitions), time will also support the development in this area. However, this does not diminish the idea that, for these pupils, the effects can be emotionally challenging (Sweet, 2015; 2018). Teachers must take great care,

therefore, to create a nurturing and safe environment in which students are free from judgement.

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