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Investigating register preferences in the female singer of contemporary commercial music

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Investigating Register Preferences in the Female Singer of Contemporary Commercial Music

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This thesis is presented in fulfilment of the requirements for the degree of
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Western Australian Academy of Performing Arts
Edith Cowan University
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Abstract

The middle register is a region of the voice which has been discussed and disputed for many years in the disciplines of vocal pedagogy and voice science. This project, which was inspired by my own experience as a singing teacher in the private studio, seeks to investigate how female professional and pre-professional vocalists relate to their middle register. For the purposes of this dissertation, the middle register is assumed to refer to an area of the trained voice, or of the voice in training.

The project is composed of three studies. In Study One a pilot questionnaire was distributed to 57 vocalists, ranging from secondary and tertiary students to professional singers. The responses to the questionnaire were analysed and the results used in the design and development of Studies Two and Three.

Study Two was made up of interviews with three professional singers, together with an analysis of their vocal technique in performance.

Study Three consisted of case studies of nine singers: three secondary students, three tertiary students, and three professional singers. The nine subjects recorded an *a cappella* version of "Scarborough Fair" and answered a short questionnaire. The participants' questionnaire responses and the expert listeners' survey results were then analysed to discover whether the singers' ideas of their performance were traceable in the expert listeners' interpretations, and whether any register preference expressed by the singers could be detected by the expert listeners.

The results of this project indicate that the listening habits of singers greatly affect the way they approach their middle register. A singer's ability to express register choice, and the degree to which other listeners were able to discern these choices, was found to correlate with level of training. The results also indicate that a register preference for either chest dominance or head dominance existed for a majority of the singers in this study, all of whom were singers of Contemporary Commercial Music (CCM. The implications for teaching singing to students of CCM with a strong register preference are discussed.

Declaration

I certify that this thesis does not, to the best of my knowledge and belief:

(i)   incorporate without acknowledgment any material previously submitted for a degree or diploma in any institution of higher education;

(ii)   contain any material previously published or written by another person except where due reference is made in the text of this thesis; or

(iii)   contain any defamatory material.

Signed:

Date: 03/06/2017

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- 2012   Presentation: *The Body of the Voice.* Conference: 2nd Symposium Horizons Crossing Boundaries, Yong Siew Toh Conservatory, Singapore

- 2013   Presentation: *Investigating the Ranges of the Female Voice.* Conference: For the love of Singing: Learning, Teaching Performing International Congress of Voice Teachers, Queensland Conservatorium Griffith University, Queensland.

- 2013   Speed Presentation: *The History of the voice and how it has Informed Performing Conventions of Today.* Conference: For the love of Singing: Learning, Teaching Performing International Congress of Voice Teachers, Queensland Conservatorium Griffith University, Queensland.

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- 2015   *An Investigation into the Origins of Belt and Legit.* Paper presented at the National Conference: Music: Educating for Life, Australian Society of Music Education National Conference, Prince Alfred College, Adelaide.

CHAPTER ONE: INTRODUCTION

This research project seeks to investigate how female professional and pre-professional vocalists relate to their middle register. The project was inspired by my experiences as a singing teacher in a private studio, in which I found that many of my students had problems negotiating the middle register of their voice. I undertook this investigation in the hope of finding some pedagogical ideas to implement in the studio to assist vocal students in accessing their entire vocal range.

The project was made up of three studies. In Study One, a pilot questionnaire was distributed to 57 vocalists. The sample included secondary and tertiary singing voice students (n=54) and professional singers (n=3). The responses to the pilot questionnaire were analysed and the results were used in the design and development of Study Three.

Study Two included interviews with three professional singers, together with an analysis of their vocal technique in performance.

Study Three consisted of a survey of nine singers: three secondary students, three tertiary students, and three professional singers. Questions were devised for this survey from an analysis of responses to the pilot questionnaire referred to above. The nine subjects recorded an *a cappella* version of "Scarborough Fair" and answered a short questionnaire. The recordings were inserted into an online survey and distributed to a panel of expert listeners, who evaluated the recordings via an online survey and answered questions about the recordings, using a transcript of each vocalist's performance as a reference. The participants' responses and the expert listeners' survey results were then analysed to discover whether the singers' appraisal of their performance corresponded with the expert listeners' interpretations of these, and whether any register preference expressed by the singers could be detected by the expert listeners.

The results of this research and the implications for teaching singing to students who have a strong register preference (i.e. a preference for singing in either chest dominance or head dominance in their middle register) will be outlined and further discussed in this thesis.

Background

The topic of this dissertation was initially triggered by my experience as a student of music theatre performance in an Australian tertiary institution from the years 1995 to 1998. During this time the vocal demands of the musical theatre industry within Australia were changing from a narrow specialization according to which a singer could perform in either a primarily "legit" style or a primarily "belt" style. In the current industry climate, it is expected that a singer is able to perform in both "legit" and "belt" singing styles. Amongst my fellow classmates, and indeed in my own case, there appeared to be a preference for one style over another. Furthermore, the student cohorts began to classify themselves as able to perform in one style or the other, but not in both. In my later experience as a vocal tutor, a recurrent problem arose when I asked students to access their entire range. The typical response from the students was that they preferred to sing in one register or another, and that they apparently disliked singing outside of this register. These strong preferences led to problems within the lesson because students resisted singing outside their preferred register. There is evidence of an awareness amongst singing teachers that students continually make choices about their sound, and furthermore that these choices are made both unconsciously and consciously (Piernay, 2007). This thesis proposes that register preference is one of the main factors affecting a student or singer's choices in regards to performance style.

The musical/performance style under examination in this dissertation is Contemporary Commercial Music, henceforth known as CCM. This term was coined by Jeanette LoVetri in 2008 to refer to what previously had been called "nonclassical music": "[CCM] is a generic term created to cover everything including music theater, pop, rock, gospel, R&B, soul, hip hop, rap, country, folk, experimental music, and all other styles that are not considered classical." (LoVetri, 2008, p. 260)

A review of the literature revealed that vocal registration in CCM is inextricably interwoven with two very different styles of singing: the so-called "belt" and "legit" vocal styles. The relationship between registration and vocal style will be explored in both the literature review and in each of the three studies of this project.

From experience, student objectives for attending lessons in my vocal studio range from singing for enjoyment to striving for a professional career. Due to the

impact of technology, my students have increased exposure to commercial music in the form of radio, television reality shows, and YouTube clips. If the students attempt to emulate the styles and techniques that are witnessed in this form of commercial entertainment, the vocal teacher must attune their teaching knowledge and expertise to ensure that students' vocal health is maintained whilst an accurate performance of vocal style is achieved (Bartlett, 2010; Robinson, 2014).

It became apparent to me in my studio setting that to teach a balanced and healthy vocal technique, I needed to understand how students could best access their entire range. A search of the available vocal pedagogy literature revealed many resources on anatomy and the science of sound, which shed some light on the use of the voice and assisted in teaching. However, there were few studies addressing register preference. This apparent gap in the literature will be explored further in the literature review.

The particular area of the female vocal range under examination in this research project is the middle register, the area of the voice in which most song tessituras lie. Overviews of register in general, of the middle register in particular, and of mixed voice as a means of managing the middle register, are given in the Literature Review. It is, however, worth briefly presenting definitions of these terms in this introductory section. The most enduring definition of register comes from nineteenth century voice teacher and researcher Manuel Garcia II:

> By the word register we mean 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. All the tones belonging to the same register are consequently of the same nature, whatever may be the modifications of timbre or of the force to which one subjects them. (Garcia, 1847)

Voice scientists since Garcia have tended to follow his lead in distinguishing between registers on the basis of *differing* patterns of vocal fold vibration which result from the actions of muscle groups working *independently* of each other (Hollien, 1975, 1983; Roubeau, Chevrie-Muller, & Arabia, 1991; Schutte & Miller, 1993; Miller & Schutte, 1994; Castellengo, Chuberre, & Henrich, 2003; Miller & Schutte, 2005; Henrich, 2006; Roubeau, Henrich, & Castellengo, 2009).

On the other hand, both classical and contemporary vocal pedagogues accept the notion of register dominance, whereby opposing muscles groups work together in co-contraction or muscular antagonism (Miller, 1986; Miller, 2000; McCoy, 2012, Edwin, 1998, 2000, 2003, 2004, 2007, 2008; Hall, 2014).

Karen Hall summarises this acceptance, whilst noting the key difference between classical and contemporary pedagogies: "[t]he music theatre mix register is a blend of head and chest register with a predominance of chest register whereas the *voix mixte* sound used in classical voice is a predominance of head register" (Hall, 2014, p. 71).

This thesis accepts the pedagogical view of the middle register as "a region where the two more salient registers are combined in varying degrees of dominance" (Miller & Schutte, 2005, p. 281). The umbrella term "mixed voice" is adopted, together with sub-categories taken from music theatre pedagogy: chest mix, head mix and mix.

The music theatre terms chest mix, head mix and mix may be defined as follows:

Chest mix is said to occur when the thyroarytenoid (TA) muscle of the vocal folds contracts to make the vocal folds thicker. At this time, a greater mass of the vocal folds is in contact during oscillation and the vocal folds meet at the midline for a longer period of time. (Scott McCoy, 2012).

Head mix is said to occur when the cricothyroid (CT) muscles in the larynx contract to stretch the vocal folds so that they are longer and thinner. At this time, a lesser mass of vocal fold is in contact during oscillation and the folds meet at the midline for a shorter period of time. (Scott McCoy, 2012).

Mix register is said to occur when neither chest mix or head mix are perceived as dominant and the singer is singing in an even quality.

My preliminary observations in the teaching studio led me to formulate the following research questions:

Research Questions

1. Do female pre-professional (singers in training) and professional singers of contemporary, jazz and music theatre musical styles express a preference for using either chest mix or head mix in their middle voice?

2. To what extent have training, listening and performance experiences affected these preferences?

3. Can these preferences be traced in recorded performances?

These questions were pursued through the three studies outlined above. The results of each study were analysed separately and then triangulated.

Aims

One of the principal aims of the study is to demonstrate that singers do indeed express register preferences and that these preferences are based on conscious or unconscious tonal preferences. If we accept a link between listening habits and vocal production, then we can assume a link between register preference and tonal preferences. The limited literature available on tonal preferences was surveyed and little information was found. This project is therefore a response to the need for further studies to be conducted in the area of tonal preferences for the benefit of the pedagogue and the performer.

Significance

It is proposed that this research will add to the literature on teaching CCM. Whereas there is a large body of knowledge available on vocal registration and register balancing generally, there is little research literature available on register preference. As mentioned above, in my teaching practice I have found that students have difficulty adjusting from one register to another. In addition, it would seem that singers express a preference for singing in one register of the voice over the other. This preference raises problems, since it is widely held that the voice is of optimal health when the vocal apparatus of head mix and chest mix are fully developed and able to work together. (Bourne, Garnier, & Kenny, 2011; Jennings, 2014; McCoy, 2004)

An understanding of the existence of register preference and the factors that might affect this preference, along with the application of teaching tools to overcome register preference, could assist vocal teachers and coaches in the field of CCM and enable singing voice students to develop their entire vocal range to its full potential. It is proposed that the findings of this project will be useful in helping to understand students' tonal preferences and in enabling the teacher in the voice studio to apply this understanding to their teaching methods.

The following chapter is a review of the literature pertaining to the thesis topic. It includes a brief survey of register terminology, a re-statement of the terminology used throughout this thesis and descriptions of the basic mechanical principles underlying the registers of the female voice. Additionally, register use in CCM is compared to the treatment of register in classical singing. The origins of 'belt' and 'legit' singing styles are reviewed and their relationship with registration is explored.

CHAPTER TWO: LITERATURE REVIEW

This chapter defines registers and describes the middle range of the female singing voice as that part of the voice in which registers overlap to produce chest voice, head voice and mix. This is carried out by reviewing the works of voice scientists and vocal pedagogues including Robert Edwin, Scott McCoy and Jeanette Lovetri. The treatment of the middle range in CCM is also summarised in this chapter and is contrasted with its use in Western Classical singing. The origins of two specific vocal styles belonging to CCM, "legit" and "belt", and their relationship to head and chest voice, are then considered.

The mechanisms of each register are described in terms of the muscular actions involved in producing head voice, chest voice and mix, noting the way in which these muscles work interdependently or independently of each other. The singer's resulting experience of resonance is also described.

Definitions of Register

The registers of the voice can be described as audible changes in timbre as a singer changes pitch when singing from low to high or high to low (Garcia, 1984; Richard. Miller, 1993; Titze, 1988). The importance of register balancing, or registration, has been acknowledged by many pedagogues and researchers. For example, Richard Miller (2008) claimed that registration is one of the most important factors in the understanding and training of the voice. However, opinions regarding the location of register, the names of the particular registers, and the physiological descriptions of register are not settled. (Bourne et al., 2011; Henrich, 2006; Scott McCoy, 2012)

Various terminologies have been used to describe the different registers. The lowest register has been termed pulse, fry or creak. The area known informally as the chest register has been called speech voice, heavy register, thick fold, heavy mechanism, chest voice, belt voice, thyroarytenoid dominant production (or TDP), shortener dominance and, most recently, Mechanism 1 or M1. The area known as the head register has been labelled head voice, light register, thin fold, light mechanism, legit, cricothyroid dominant production or CDP, lengthener dominance and Mechanism 2 or M2. The highest register has been referred to as whistle, flute pipe, Mechanism 3 or M3. (Bourne et al., 2011; Henrich, 2006; LoVetri, 2008; McCoy,

2004, 2007; Scott McCoy, 2012) Henrich states, "In the singing voice community, the definition, numbers and labelling of registers are still a matter of debate, and they continue to vary among authors." (Henrich, 2006, p. 6)

Over the past 35 years, voice scientists from Hollien in the 1970s and 1980s, to D.G Miller and Schutte in the 1990s and 2000s, to Henrich, Castellengo and Roubeau in the 2000s, have defined register as a largely laryngeal event. Such an approach views register change as singers transition through their range in terms of modifications occurring in the larynx, related to alterations in the length and thickness of the vocal folds, and resulting in differing vibratory patterns (Castellengo, Chuberre, & Henrich, 2003; Henrich, 2006; Hollien, 1974, 1983; Miller & Schutter, 1994; D. G. Miller & Schutte, 2005; B. Roubeau, Chevrie-Muller, & Arabia, 1991; Bernard Roubeau, Henrich, & Castellengo, 2009; Schutte & Miller, 1993). Most scientists also acknowledge that registration is not based on laryngeal activity alone, but is produced by a combination of laryngeal activity and changes made in the supra-glottal vocal tract. The vocal tract is defined as the passage beginning directly above the larynx through to the back of the mouth (oro-pharynx) and other structures of the mouth including the lips and tongue.

Whereas vocal tract adjustments have proven difficult to measure, voice scientists have been able to discern changes in activity in the larynx when a singer vocalizes in a different register, (Henrich, 2006), and have described these laryngeal changes in terms of mechanical principles. Henrich states:

> It is difficult to give strong evidence of these vocal tract adjustments, as the vocal tract resonances are difficult to measure reliably from the acoustic signal, especially when the harmonic spacing is broad. On the contrary, the laryngeal transition phenomena, which are related to a sudden adjustment of the glottal vibratory pattern, are more easily detectable. (Henrich, 2008, p. 8)

As outlined in the Introduction, the three main registers of the voice that are discussed throughout this thesis are chest mix (also referred to as "chest voice", since this term is commonly used by participants in the studies), mix, and head mix (also referred to as "head voice", since this term is commonly used by participants in the studies). The fact that there are so many terms in the literature is due to the continuing discussion amongst voice scientists and pedagogues regarding the registers of the voice. These definitions are often at the discretion of the author. The

variety of definitions in this current study is a direct result of the variety of register descriptions used by participants during interviews and questionnaires throughout the research period.

In this dissertation, the following terms are used to refer to the mechanism of chest dominant production:

- Chest voice
- Chest mix
- Chest register
- Chest dominance
- Thyroarytenoid production (TDP)
- Lower register

The most commonly used term throughout this thesis when referring to chest dominant production is chest mix register.

The following terms are used to refer to the mechanism of mix register:

- Mix voice
- Mix register
- Middle voice
- Middle register

The most commonly used term throughout this paper when referring to a balanced mix of cricothyroid and thyroarytenoid muscle production is mix register.

The following terms are used to refer to the mechanism of head dominant production:

- Head voice
- Head mix
- Head register
- Head dominance
- Cricothyroid production (CT)
- Higher register

The most commonly used term throughout this paper when referring to head dominant production is head mix register.

The Mechanical Principles Underlying Register

The major changes in the larynx related to registration are due to the activity of two intrinsic muscle groups, the thyroarytenoid and the cricothyroid muscles.

Chest dominance

The thyroarytenoid (TA) muscle group is dominant when the singer is singing in so-called chest voice, as Edwin describes: "[t]he TA [thyroarytenoid muscle] is responsible for shortening and thickening the vocal folds, thus producing the sound that is commonly associated with chest voice in both men and women." (Edwin, 2007, p. 214) Use of this muscle group has also been described as "thyroarytenoid dominant production" (TDP). (McCoy, 2004) In this mode, the thyroarytenoid muscle (a component of the histology of the vocal folds) contracts to make the vocal folds thicker. At this time, a greater mass of the vocal folds is in contact during oscillation and the vocal folds meet at the midline for a longer period of time, (see Figure 1 below).

arytenoid cartilage

vocal ligament

thyroarytenoid

anterior thyroid cartilage.
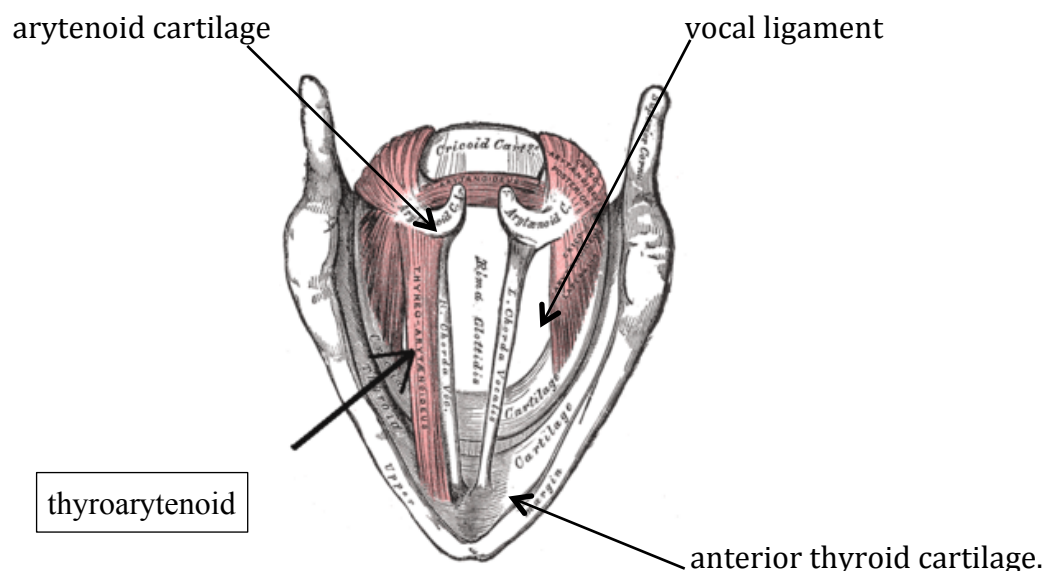
Figure 1. Vocal Folds (McCoy, 2004, p. 117)

A "classical" approach to the middle range is characterized by the "comfortably low", tilted larynx position, which encourages a greater connection to head voice production. On the other hand, the "nonclassical" approach prefers

a vocal tract configuration which is closer to speech (Jander, Harris, Fallows, & Potter, 2001), enabling a greater use of chest voiceA singer using chest dominance is often described as having a bright timbre, and is likely to exhibit a "twangy" sound (Bourne et al., 2011; Lebowitz & Baken, 2011). A chest dominant registration is often the sound that a young CCM student will bring into the studio because it is characteristic of commercial music played on the radio and in commercial television talent shows. (Bartlett, 2010; Robinson, 2014) The CCM style of belt singing is associated with extending the range of this register. Belt voice will be further explored later in the chapter.

Head dominance

Head voice or head dominance occurs when the cricothyroid (CT) muscles in the larynx stretch the vocal folds so that they are longer and thinner. At this time a lesser mass of the vocal folds is in contact during oscillation. Because of the role they play in lengthening the vocal folds, the cricothyroid muscles are often called the lengthener muscles (McCoy, 2004; Thurman et al., 2000). For the same reason, some voice teachers refer to head dominance as lengthener dominance.

A singer using head dominance is often described as having a loftier tone or exhibiting a darker timbre. In this context, loft refers to a resonance characteristic, rather than Hollien (1974)'s use of "loft" as the equivalent of "falsetto": "loft resonance…is created by relaxing and enlarging the pharynx, and lifting the soft palate, (McCoy, 2012, p. 2) The term head voice developed as the areas of sympathetic vibration often felt in this register are the sinuses the forehead, and the top of the head. When a singer is singing in head dominance, the vowels are produced with a more rounded or elongated vocal tract shape. (Jander et al., 2001) The singer aims to make a larger space in the back of the mouth and is sometimes instructed to place the voice further back than in chest voice. The stylistic association for head dominant registration in CCM is known as 'legit' (J. E. Balog, 2005). The relationship between head dominant registration and 'legit' will be further explored later in this chapter.

Edwin (2004) advises that during singing both chest and head registers should involve activity of both the thyroarytenoid (TA) and the cricothyroid (CT)

muscle groups. So, whereas the female singer using chest dominant registration may use mostly the thyroarytenoid muscle group, there is still some activity from the cricothyroid muscle group. Conversely, while a female singer using head dominance may use mostly the cricothyroid muscle group, there will still be some activity occurring in the thyroarytenoid muscle group (Edwin, 2004).

When the singer and/or listener cannot determine which register is dominant, the vocalist is assumed to be accessing both CT and TA muscle groups, and the registration is said to be a balanced mix of both. This registration has been described as mixed voice or mix (Bourne et al., 2011; Henrich, 2006; LoVetri, 2008; McCoy, 2004, 2007).

With reference to Western classical singing, Richard Miller (1986) describes mixed voice - also referred to by historical terms such as *voce media, voce mista, voix mixte* or the *zona di passaggio* (the passage zone) - as the way in which the CT and TA muscles outlined above work in opposition to each other, slowly switching from one type of dominance to the other as the singer sings through her range. Miller defined the area of the voice where registers overlap as the middle register. "The area between the two pivotal registration points…is designated as the *zona di passaggio* (the passage zone) or *voce media* (middle voice) (Miller, 2008, p. 8).

The Middle Register of the Female Voice

The focus of this research project is to discern patterns in a female singer's choice of registration within her middle range. These choices may be influenced by the sympathetic vibrations experienced by a singer, singing in a particular register, often referred to as resonance, and are also explored in the study.

It is thought that the experience of resonance could be one that the singer becomes accustomed to and reliant on. The sensations of resonance which a singer experiences when singing in different registers are significant, especially with regards to feelings of comfort or discomfort. The name *chest voice* resulted from feelings of sympathetic vibrations, or resonance, in the chest area. Similarly, the name *head voice* resulted from feelings of sympathetic vibrations or resonance, in the head area.

It may be that these resonance sensations are a factor contributing to a singer's preference for one timbre or register of the middle voice over another. For example, a singer may enjoy the sensations of chest dominance over those of head dominance, or vice versa. The relationship between resonance and register preference is tested in this research project.

In Western classical singing an even timbral quality throughout the entire vocal range is considered to be an important aesthetic accomplishment, and this is largely achieved though the training and development of the middle register. (Miller, 1986) Miller states, "A singer must learn to bridge areas of lower and upper ranges by means of vowel modification, accomplished by resonance balancing and by an adjustment in breath-management levels (Miller, 1986, p. 8). However, in CCM, discrete tonal qualities between the registers can at times represent a stylistic choice (Henrich, 2006; McCoy, 2012).

Whilst Miller (1993) advocates the importance of developing a balanced even tone throughout the vocal compass, he relates the register system to that of the inflected speech range. Miller states that the areas of register transition, or passaggios, of the voice may be placed as follows: the first passaggio occurring at the end of the speech range and the second passaggio occurring a fourth above this range. He refers to the range in between these passaggios as the calling or shouting range, although he deems that calling or shouting is inappropriate to well registered singing. This area of the voice is referred to the *zona di passaggio* (passage zone) or the *voce media* (middle voice) (Miller, 2008, p. 19). This reference to the calling or shouting range will be further explored in this chapter in discussion of the origins of belt and legit.

According to McCoy the lower register of the female voice may sound strong and vibrant, whereas the higher register of the female voice may sound thinner and breathier, particularly when the voice is untrained (McCoy, 2012, p. 142). These breathy and thin qualities are at times accessed by female singers of CCM (where the desire for a unified range is less important) and are used for expressive purposes as part of their interpretation. Whereas breathy phonation and thin timbre are undesirable in Western Classical singing, some singers make a mindful decision to employ these sound characteristics for creative expression in CCM styles.

Middle Register in Contemporary Commercial Music

Whilst the scholarly research on the middle register in Western Classical singing dates back some three hundred years (Osborne, 1979a), the treatment of the middle register in CCM has only been discussed in the literature since the late 20th century. Vocal pedagogue, Karen Hall, states:

> Since 1990, there has been a great deal of research conducted on mix/belt singing. The perceptual and scientific information now available offers a clearer picture of what constitutes healthy mix/belt singing. Studies by Bestebreutje and Schutte: LeBorgne; LoVetri; Lesh, and Woo; Miles and Hollien; Robison, Bounous, and Bailey; Schutte and Miller; Sundberg, Gamming and LoVetri; and Titze suggest that although there are commonalities in the mix/belt voice production, there are several ways to product healthy mix/belt singing. (Hall, 2014, p.5)

However, there is still a need for further research, as stated by Dr. Nathalie Henrich:

> The resonant properties of these [middle or mix] registers still need to be explored, so as to understand how a singer manages to mimic the voice quality of a given register while using an inappropriate mechanism…Furthermore, major voice quality differences are avoided in the Western lyric culture, whereas they may be a prime goal in other vocal cultures, such as jazz, blues and rock. Knowledge of singing voice registers would gain from a better understanding of these non-classical phonation types. (Henrich, 2006, p.12)

Regardless of whether the CCM singer chooses to make timbral distinctions between her registers, or aims for a unified timbre through the entire range, the researcher presumes that the singer still needs to be able to make full use of her voice and to understand its function when performing in each register. Whereas there is considerable literature about the middle register in Western classical singing, there is little literature about the use of the middle register in CCM. As Henrich acknowledges:

> Major voice quality differences are avoided in the Western lyric culture, whereas they may be a prime goal in other vocal cultures, such as jazz, blues and rock. Knowledge of singing voice registers would gain from a better understanding of these non-classical phonation types. (Henrich, 2006, p. 11)

Jeanette LoVetri is a teacher and researcher based in the United States. As mentioned in the Introduction, Lovetri introduced the term CCM as a descriptor for most musical styles that lie outside of Western classical singing. This includes but is not limited to pop, rock, country, rhythm and blues, jazz and musical theatre and their various sub-styles. (Lovetri, 2008, p. 260) Lovetri is credited with being one of the first pedagogues to draw attention to the problem of teachers trained in classical singing attempting to teach students of CCM (LoVetri, 2002).

However, the idea that singers of CCM require a different pedagogical approach was voiced as early as 1979 by Conrad Osborne in a two-part article for the music magazine *High Fidelity* entitled "The Broadway Voice: Just Singin in the Pain." (Osborne, 1979a) During the late 1970s and early 1980s Osborne worked as a private vocal tutor in New York, with a studio demographic of young adult performers seeking employment in the musical theatre industry. Osborne made a critical observation of the demands that singers were put under when performing on Broadway, in particular of the vocal stresses inflicted on the performers. What he was referring to was the practice of "belting".

Osborne emphasizes the lack of training available for teachers and students of Broadway singing, noting that training "coalesced in something very like their present forms about 150 years ago." (Osborne, 1979, p. 58) He goes on to say that "these usages [of belt singing] are not only vocally destructive to a shameful degree… they are expressively limited in ways that drastically fore-shorten the aesthetic range of the (belt) form." Osborne adds:

> Admittedly they open up certain types of expressive gesture denied the purely "legit" vocalist: but I hope to show that more is lost than gained, while at least some of the gain could be retained through moderate exercise of common sense and care. (Osborne, 1979, p. 58)

Putting aside Osborne's judgements on the safety of belting, it is clear that a different approach needs to be taken. Weekly and LoVetri (2009) point to the set of demands that teaching CCM puts on teachers, and her arguments have been repeated in the literature by many other researchers. For example, music theatre pedagogue Karen Hall took up the discussion on the dichotomy between classical and musical theatre singing training:

> While teaching the music theatre students at The Boston Conservatory, I found that I needed to adapt my teaching methods. Clearly, classical vocal technique, vocabulary and repertoire were, in most instances, not appropriate for these students. Furthermore, there were few instructional materials available to assist me in transitioning from teaching classical to music theatre singing. (Hall, 2007)

The distinction between classical and CCM singing is internationally agreed upon in current vocal pedagogy. See below for references on differences between Classical and Contemporary singing:

- Bartlett, I. (2010). One size doesn't fit all: Tailored training for contemporary commercial singers. In S. D. Harrison (Ed.), Perspectives on teaching singing: Australian vocal pedagogues sing their stories (1st ed., pp. 227-243). Brisbane: Australian Academic Press.

- Björkner E, Sundberg J, Cleveland T, Stone RE. (2006). Voice source differences between registers in female musical theatre singers. Journal of Voice, 20, pp. 187–197.

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

- Edwin, R. (1998). "Belting 101, Part Two", Journal of Singing, 55:2, pp. 61-62.

- Edwin, R. (1998). "Belting 101", Journal of Singing, 55:1, pp. 53-55.

- Edwin, R. (2000). "Belting revisited", Journal of Singing, 75:2, pp. 43-44.

- Edwin, R. (2003). "A Broader Broadway", Journal of Singing, 59:5, pp. 431-432.

- Edwin, R. (2004). "Belt Yourself", Journal of Singing, 60:3, pp. 285-288.

- Edwin, R. (2007). "Belt Is Legit", Journal of Singing, 64:2, pp. 213-215.

- Edwin, R. (2008). "Cross Training for the Voice", Journal of Singing, 65:1, pp. 73-76.

- Edwin, R. (2009). "What's Going On On Broadway?", Journal of Singing, 66:1, pp. 71-73.

- Estill, J. (1996). Compulsory figures for voice: a user's guide to voice quality. Santa Rosa, CA: Estill Voice Training Systems.

- Lebowitz, A., Baken R. J. (2011). "Correlates of the Belt Voice: A Broader Examination", Journal of Voice, 25: 2, pp. 159-165.
- Lovetri, J. L. (2002). "Contemporary Commercial Music: More than One Way to Use the Vocal Tract", Journal of Singing, 58:3, pp. 249-252.
- Lovetri, J., Lesh, S., Woo, S. (1999). "Preliminary Study on the Ability of Trained Singers to Control the Intrinsic and Extrinsic Laryngeal Musculature". Journal of Voice, 13:2, pp. 219-226.
- Popeil, L.S. (1999). "Comparing Belt and Classical Techniques Using MRI and Video-Fluoroscopy". Journal of Singing, 56:2, 27-29.
- Popeil, L.S. (2007). "The Multiplicity of Belting", Journal of Singing, 64:1, pp. 77-80.
- Schutte HK, Miller DG. (1993). "Belting and pop, nonclassical approaches to the female middle voice: some preliminary considerations". Journal of Voice, 7, pp. 142–150.
- Zangger, D. B. (2008). Ultimate Vocal Voyage: The Definitive Method for Unleashing the Rock, Pop or Soul Singer Within You. Notfabriken Music Publishing.

Pedagogy has come a long way since Osborne's rather scathing attack on the vocal techniques of belt singing. It is now widely agreed by teachers of CCM that when belt style singing is performed with the correct physical technique, it can be quite safe. However, in comparison with classical pedagogy, the literature on teaching CCM remains limited. As Bartlett (2010) acknowledges: "LoVetri's observations and those of the voice scientists are important as they continue to highlight the field of contemporary commercial singing as under authorized." (Bartlett, 2010)

Additionally it is my view that there is insufficient teacher training available for CCM teachers. Following the appearance of Jeanette LoVetri's influential 2002 article "Contemporary commercial music: More than one way to use the vocal tract" in the official journal of the National Association of Teachers of Singing (NATS), the *Journal of Singing*, there has been a growing awareness of the importance of developing techniques, knowledge and skills for teachers of CCM. The significance of this is evidenced in the inclusion since 2002 of a column entitled "Popular Song and Music Theater" in that same journal (Lovetri, 2002).

In summary, the literature on the use of the middle register is largely dominated by Western Classical pedagogy. There have been numerous methods from this tradition written over hundreds of years and the vast majority of these are concerned with the unification of timbre across the range. On the other hand, the sparser literature on the application of the middle register when singing in CCM acknowledges that there may be distinctive timbral differences but does not go much further than making this distinction.

The researcher observes that singers of CCM can use the middle register to accentuate their timbral variations, or can choose to keep the timbre balanced by blending the registers of the head and chest voice as much as possible throughout the entire range, as is the convention in Classical singing. The main point that can be gathered from the literature is that although Classical and CCM pedagogies are recognised as having different technical applications, researchers in both fields acknowledge the importance of developing both the head and chest voices.

The Origins of Belt and Legit

The vocal student will bring into the studio sounds that she has heard and emulated from other singers. These singers could be family members or professional recording artists (Bartlett, 2010; Robinson, 2014). As has already been noted, two of the most featured vocal styles of CCM are belt and legit style singing (Balog, 2005).

The origins of belt and legit singing styles can be traced back to operetta and musical comedy in the case of legit singing, and to minstrelsy and vaudeville in the case of belt singing. The origins of legit and belt play an important role in this research since it is assumed that the present-day singer has been influenced by these vocal styles through their listening experience, and is likely to take these experiences into their own practice. Even if the singer is unaware of these origins, she has probably been affected by them.

In their article "The necessity of using functional training in the independent studio", Hall and LoVetri state: "[m]usic theatre is complex to understand because it encompasses all styles from classical (or "legit") music through [to] rock and roll" (Hall & LoVetri, 2013, p. 83). Today, largely for reasons of employability, musical

theatre performers are required to sing in both legit and belt styles (Balog, 2005; Bourne et al., 2011; Hall & LoVetri, 2013). LoVetri clarifies this point:

> In music theatre, specific register qualities are expected and frequently required as part of the abilities a vocalist must have in order to get a job. Casting notices frequently state: "Must belt to D, must mix to F", "must sing legit to A" Sometimes they state: "Must be able to sing a rock belt and a classical legit," for the same role! (Lovetri, 2013)

It seems clear that the demands of each vocal style and the ability to move from belt to legit require artistic flexibility and vocal training.

Description of legit voice

Legit is the shortened form of 'legitimate,' a term that was coined to describe a style of singing popular music that displays elements of classical technique (Edwin, 2003). The vocal qualities of legit style singing include a loftier timbre, an emphasis on rounder and taller vowels, long legato lines and the presence of vibrato. (Edwin, 2003; McCoy, 2007; Williams-Jones, 1975) Balog (2005) describes the use of the legit voice as close to the style of classical singing for the upper notes. It can be inferred from the descriptions given previously, that head dominance is another characteristic of legit style singing.

Description of belt voice

The characteristics of belt have been described as loud, bright, closely related to speech, twang, lacking in vibrato, yell-like and consonantal (J. E. Balog, 2005; Bestebreurtje, 2000; Lisa, 2007; Popeil, 2007). Singers singing in belt style often describe the feeling of the sound being placed very forward (Auslander, 2004; Bourne et al., 2011; Delp, 2001; Edwin, 2004, 2007; Williams-Jones, 1975). Grant discusses the use of consonants in the singer's performance of belt singing in contrast to the legato lines produced by uniformed vowel formations, as is the convention in classical singing (Grant, 2004). Grant gives an example of this style of singing:

> On a 1911 recording, [George M.] Cohan's first wife, Ethel Levey (1881-1955), reprises a song she sang in her ex-husband's 1906 show George Washington Jr. called "I was born in Virginia"; she sang in a contralto range in a brassy chest voice that can only be described as belting. (Grant, 2004, p. 20)

It is inferred from the descriptions given above that chest dominance is another characteristic of belt style singing.

The researcher deems it important to trace the evolution of the origins and development of these sounds in relation to CCM because of the potential influence they may bring to bear on a singer's tonal or register preferences.

The Influences of Operetta and Early Musical Comedy on the Musical

Both Banfield (2000) and Grant (2004) situate the evolution of belt and legit singing styles within a history of popular vocal performance in the twentieth century. The following discussion focuses on the period at the beginning of the twentieth century, which saw the emergence of legit and belt singing as commercially sustainable styles.

Knapp (2006) claims that the American musical grew from the conventions and style of the European operetta, including the works of British musical comedy writers Gilbert and Sullivan. The vocal style and technique of trained operetta voices were heard in the early musical comedies on Broadway. (Grant, 2004; Osborne, 1979b; Williams-Jones, 1975) In the history of early musical comedy in America, there were times when opera performers were recruited directly from the Metropolitan Opera Company to perform in Broadway shows. (Williams-Jones, 1975). One of these performers was Fritzi Scheff, a singer at the Metropolitan Opera who also found employment on Broadway. (Grant, 2004; Osborne, 1979a) In his review, Allen (1917) described one of Scheff's performances as follows: "Fritzi Scheff is the principal artist here…and never has the noted prima donna been seen to better advantage. Her voice is of beautiful texture and delightful to listen to." (Allen, 1917, p. 8)

According to Grant (2004), pre-1900 recordings provide evidence that popular singing styles and the legitimate singing of opera and operetta were very much alike. One of the most prolific stars of Broadway during the early 1900s was Lillian Russell. Grant describes her singing of *Come Down, Ma Evening Star* from the show *Twirly Wirly* (1902) as "a light and flutey mezzo" (Grant, 2004, p. 16).

Influence of Minstrelsy and Vaudeville on the Musical

A greater division between popular singing and legitimate singing seems to have emerged after the early 1900s. At the same time as legitimate singing was heard in the theatres and opera houses, another type of entertainment known as vaudeville was extremely popular and highly frequented (Grant, 2004). The type of singing heard in vaudeville venues was regarded as "low brow" as opposed to "legit singing", which was regarded as "high brow" (Edwin, 2007). Edwin states:

> Legit (shorthand for "legitimate") is aligned most closely with classical singing and had its origin in early music theatre. It was considered "high brow" and the only singing acceptable in civilized and proper society. Belt, on the other hand, was looked on as "low brow", commercial, and somewhat that bastard child of authentic singing. It inhabited minstrel and riverboat shows, burlesque, vaudeville, dance halls, and other popular venues. (Edwin, 2007, p. 213)

Aside from Edwin, many scholars have described belt singing as having its origins in vaudeville, but its roots may also be found in the minstrel show, a forum in which white performers blackened their faces and performed as caricatures of the African-American population. The now racist term "coon singer" grew out of the minstrel show and was developed further in vaudeville, where their songs became "coon songs" (Dormon, 1988). Grant (2004) claims that available recordings reveal "coon singing" to be "consonantal" and that it sounded like "talk singing" (Grant, 2004; Williams-Jones, 1975).

Casey (2015) reports that coon singers spoke and sang in an accent that emulated the accent of the African-American population. Around the early 1920s, minstrel shows became increasingly unpopular because of negative reactions to their racial content. However, singers performed in the same vocal style (but without blackface) in vaudeville. One of the most famous exponents of this practice was Sophie Tucker. (Foster, 2005)

Pleasants (1974) proposes that Tucker was influenced by black vaudeville and nightclubs and by the "race records" that were popular with the African-American population. This assertion seems to be corroborated by the testimony of two female artists, Ethel Waters and Alberta Hunter, who were "coon shouters" of

the early 1900s, and who claimed that Sophie Tucker asked to study their styles and even paid money for private performances to learn their way of singing.

Hunter discusses how Tucker asked her (unsuccessfully) to teach her some of her repertoire: "[Tucker] would send her maid Belle for me to come to her dressing room and teach her the songs, but I never would go, so her piano player would come over and listen and get everything down" (Boyce-Tillman, 1999). Anthony Slide (1981) discusses Tucker's own singing style: "the style of singing was brassy and loud, and Sophie Tucker talked a song as much as she sang it; there was a worldliness in her voice, but there was also kindness and compassion." (Slide, 1981, p. 154)

Casey (2015) referred to the timbre of Tucker's voice as "deep and booming", and she was said to sing in the same dialect as African-American singers. As quoted in Casey's article, Tucker herself confirms the use of dialect in her performances: "[m]y greatest difficulty was convincing the audience I was a white girl. My Southern accent had got to be as thick and smooth as molasses."(Casey, 2015, p. 16) Another "coon shouter" of note was May Irwin, whom Grant (2004) describes as having the appearance of an opera diva. She was also reported to use consonantal or talk singing rather than long vocal phrasing.

On the other hand, legit singing was also used in vaudeville. In his article "The Vaudevillians", Slide (1981) identifies Grace La Rue as a singer who performed in the theatrical venues of musical comedy but who also crossed over to sing in a legit style in vaudeville. This points to the way in which each of these vocal styles has been exploited in a variety of contexts and forums, a cross-fertilization which seems to have been an important factor in the development of musical theatre as a vibrant and lively theatrical form.

It has been said by researchers, including Grant (2004), that the legitimisation of belt singing in musical theatre began in 1930 when Ethel Merman sustained a high C (C5) in chest voice during her performance of "I've Got Rhythm" in Gershwin's *Girl Crazy*. Merman's use of a chest dominant belt production allowed her to sustain this note without amplification over an orchestra that included, among others, Benny Goodman, Glen Miller and Gene Krupa (Bourne et al., 2011; Grant, 2004; Williams-Jones, 1975). Merman continued her career as one of the most

famous early belters of Broadway, and remains a forebear of the belt style to this day (Robinson-Martin, 2009).

The link between Ethel Merman and the sounds of the "coon singers" of vaudeville can be traced back to Merman's early exposure to this form of entertainment. Kellow (2008) and Flinn (2007) tell how Merman's parents took her on Friday evenings to the Palace Theatre to hear singers like Sophie Tucker, Fanny Brice and Blossom Steeley.

Grant (2004) acknowledges that a further influencing factor over the styles of legit and belt was the invention of the microphone in the 1920s. This technological advance allowed singers to produce a vocal quality that was even more speech-like than "coon singing". The advent of the microphone served to diminish the technical demands of acoustic singing and allowed singers to produce more subtle tones, leading to the emergence of the so-called 'croon singer'. Grant (2004) asserts that this was a defining reason for legit taking a back seat to belt, and for the development of a more consonantal style of singing in musical theatre. The importance of the microphone is not to be understated for singers of CCM, indeed Jeanette LoVetri (2008) argues that CCM style singing and the microphone cannot be divorced from each other.

> All CCM styles evolved from colloquial speech, and all of them are electronically amplified. Therefore, CCM vocal production cannot be divorced from amplification…This means that the singer's auditory function and perception must be examined in direct relationship to vocal production. (LoVetri 2008, p. 261)

In current musical theatre productions the sound of belt exists alongside the sound of legit singing (Bourne et al., 2011; Hall & LoVetri, 2013). An example of this comes from the musical *Wicked*, in which one of the female leads, Glinda, is required to use both belt and legit singing in her performance (Edwin, 2009). In the current climate of musical theatre, there is an expectation that musical theatre performers will be skilled in both styles and able to switch seamlessly from one to the other.

Whereas belt and legit singing styles existed side by side in musical theatre, as the historical overview above demonstrates, this vocal flexibility on the part of the individual singer is a relatively new phenomenon, and one which speaks directly to

singer training. As far as CCM styles other than musical theatre are concerned, evidence of belt style can be traced in the performance of contemporary pop music by female singers like Shania Twain, Beyonce, Whitney Houston, Christina Aguliera, LeAnn Rimes, Mariah Carey and many more (Edwards, 2002). Legit style singing is harder to trace in the area of contemporary pop music, but in the researcher's opinion, artists Jasmine van den Bogaerde (known as Birdy), Katie Noonan and YouTube singer Jasmine Thompson use legit style singing in their performances. So, although it is admittedly employed to a lesser degree, legit style remains in use in contemporary music. Therefore, it is another tool or expressive style of singing for the CCM singer to employ in their repertoire of stylistic choices.

The researcher suggests that the link between registration and style is important in addressing the use of the female middle register. The timbral differences between belt and legit style, both of which are common to CCM, are inextricably linked through timbral and functional similarity to chest and head dominance respectively. Whereas Conrad Osborne claimed that belt and legit styles reflect the classical registrations of head and chest, current CCM pedagogues have argued that belt singing is not exactly synonymous with chest voice (Balog, 2005), but is rather, as noted by Jeanette LoVetri "a label given to a certain aspect of chest register function." (LoVetri, 2002, p. 162)

It is interesting to note here the connection between belt, with its possible origins in "coon shouting", and the calling or shouting range that Miller describes in relation to the middle voice. It would seem that although Miller does not encourage the development of this vocal usage for classical singing, he acknowledges that it is a primal function of the voice. (Miller, 2008, p. 27)

The researcher will explore the impact of registration and style when addressing the second of the central research questions: "To what extent have training, listening and performance experiences affected this preference?"

Listening Habits and Tonal Preferences

Outside the field of vocal pedagogy, there has been limited academic inquiry into tonal preferences. Previous research includes studies of listening preferences and the spoken voice (Fernald, 1985); listening preferences and world music (Fung, 1994),

timbral preference and instrument choice (Williams 1996) and tessitura preference (Chinn, 1997). This study goes part way to extending a scholarly interest in this area of vocal production and pedagogy.

Despite this lack of formal study, the link between critical listening, mental images and tonal preferences that originate in the mind of the singer has long been acknowledged by voice teachers. The process could be described as follows: critical listening leads to stylistic awareness and the development of tonal preferences, which together contribute to an internal vocal image, which combines with vocal production to result in a singer's individual voice.

The concept of a singer hearing a particular sound before she makes it belongs to a time-honoured pedagogical tradition. James McKinney declares, "[b]eautiful sounds start in the mind of the singer. If you cannot think a beautiful sound, it is an accident if you make one." McKinney recommends "listening intelligently to a sizable number of artist singers" in order to "arrive at a vocal model which can serve as a guide and goal in your own pursuit of vocal excellence." (McKinney, 2005, p. 78) Similarly, Donald Allen Freed advises singers to "make a picture of a beautiful tone, then produce it." (Freed, 2000, p. 9)

Clifton Ware (1998) presents two concepts relating to vocal perceptions. One is the mental imagining of the sound that the singer would like to produce, and the other is the realistic perception of what the singer is technically able to produce. According to Ware, the value of training and critical listening is the part they play in developing vocal perceptions in order to actualise the singer's creative goals.

Stylistic awareness as developed through "intelligent listening" is also important. Ware states that, "[w]hat one wants to hear in a singer's voice by way of tone and communication is inextricably connected to style, a characteristic manner and mode of expression." (Ware, 2008, p. 4) Other influences on tonal preferences can be cultural, and this is expressed by Miller (1986) when he discusses the impact of cultural conditioning on the singer and the choices they make in their performance (quoted in Ware, 1998, p. 4).

Ware asks: "[w]hat determines an individual's preference for a particular vocal music style of singing and presentation?" (Ware, 1998, p. 3) This question relates directly to the present study. He mentions the availability of listening options,

particularly the way in which radio presents almost every genre and musical style to the listener. In the ensuing years, these options have become even broader through the emergence and accessibility of the Internet and the development of the digital radio. This means that listeners have an abundance of musical choices available to them at any given time.

The views expressed above support the importance of listening experiences as a way of informing a singer's tonal preferences and developing her tonal concept. This concept will in turn have an impact on the singer's vocal production and register preferences. This hypothesis was tested in questionnaires and interviews when singers were asked about their vocal practice.

The relationship between the singer's listening experiences and the existence of a preferred vocal quality is an important aspect of the present study. This thesis will explore the idea that a singer's mental tonal image is closely related to their listening habits and preferences. The link between these and a singer's vocal production will be explored separately and explained in Chapter Three.

In summary, this chapter has defined the terms that will be used to describe registration throughout the thesis, and presented the mechanical principles of registration of the female voice. The middle voice was identified as that part of the voice where the registers overlap, and the experience of resonance when singing in the various registers was briefly discussed. The origins of two specific vocal styles that belong to CCM were defined as 'legit' and 'belt' and these styles were aligned with the use of chest and head dominant registration. The researcher has presented some views from the literature on tonal preferences in order to highlight the lack of knowledge on register preferences, especially with regard to singing in CCM.

In the next chapter the methods of data collection employed for the three studies of this project are described and the rationale for a multi method approach is given. Data collection methods included questionnaires, interviews and case studies, and both quantitative, and qualitative data analysis, including Interpretive Phenomenology Analysis were employed.

CHAPTER THREE: RESEARCH METHODOLOGY AND METHODS

Chapter Three presents the methodology for this research project and the methods of data collection used. Firstly, the rationale for a multi-method approach will be given. This will be followed by a description of the various methods employed, including a step-by-step account of the procedures for each of the three studies, and an explanation of how the patterns and themes identified in the first two stages informed Study Three.

Each of the three studies is described in detail, including its purpose, how it relates to the central research questions, and the specific methods of data collection employed. How and why the participants were recruited is also discussed, and the questions asked of the participants are disclosed in table format. The design and purpose of the questions asked of each group of participants are explained in detail.

Choosing the Methodology

The research methodology chosen for this project was a multi-method approach, including questionnaire distribution, interviews and case studies (see Table 1). It was deemed that these methods were most suited to investigate a phenomenon or "set of processes, events or individuals or other things of interest to the researcher" (Gall, Borg, & Gall, 2005). The phenomenon investigated by the researcher were the choices that singers make while singing in their middle register. The data collected from these studies were interpreted using both qualitative and quantitative approaches. Qualitative data were analysed using Interpretative Phenomenological Analysis (IPA). Smith and Osborn state that "[t]he aim of Interpretative Phenomenological Analysis (IPA) is to explore in detail how participants are making sense of their personal and social world, and the main currency for an IPA study is the meanings particular experiences, events, states hold for participants" (Smith & Osborn, 2008, p. 53). There was no assumption of a pre-empted behavior. By asking questions and making observations of the singers, data was generated and analysed, and answers to questions resulted in description (Schwandt, 2001).

Table 1: Methodology Hierarchy

Multi Methods	
	Study One Questionnaires - use of IPA manual proceedures
	Study Two Interviews - use of IPA computor-based proceedures (NVivo)
	Study Three Case Studies - consisted of participant observation, survey and listening analysis
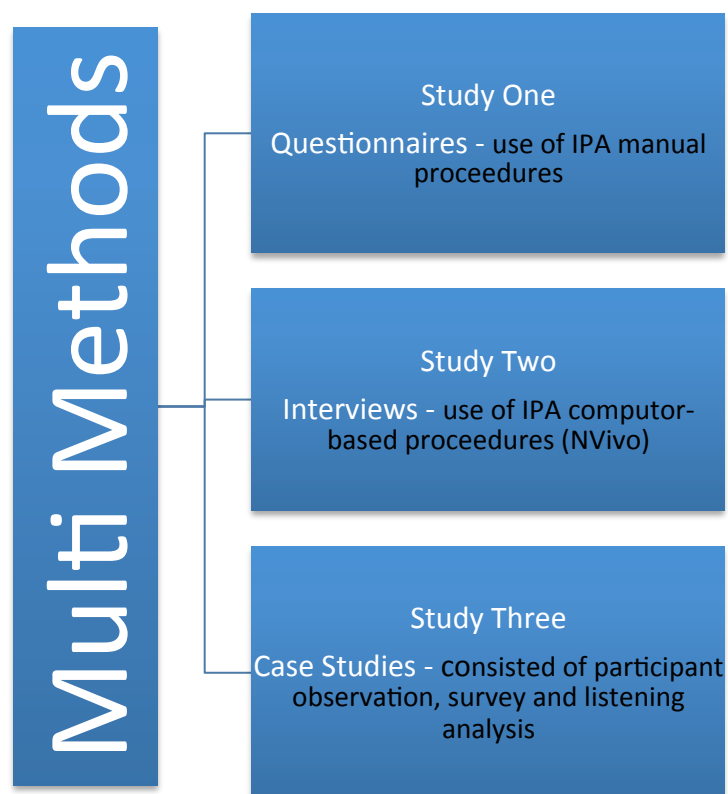
Gathering Data

The research methods used throughout this project comprised questionnaires, interviews, participant observation, and listening analysis. Study One consisted of a questionnaire. Olsen (2012) has described questionnaires as an effective method of gathering preliminary information on collective attitudes; in this case on the singers' attitudes towards their own vocal practices (training and performance experiences) and the way in which these practices were influenced by others' vocal practices (listening experiences). It was decided that the questionnaire would be a suitable method to gain an overview of participants' attitudes and practices from which to launch further investigation.

Study Two consisted of interviews with three professional singers. Using this method, the researcher sought to explore the singers' listening, training and performance experiences with specific regard to their use of the middle voice. Since the information sought was of a focused nature, it was decided that a semi-structured interview would be the best method to employ, with the built-in option for both parties to branch off into subtopics about ways in which their training, performance

and listening experiences had influenced their use of the middle voice (Olsen, 2012; Schwandt, 2001).

Both the questionnaire and the interviews were coded using the descriptive coding method that Saldana (2012) advocates in *The Coding Manual for Qualitative Researchers*. The questionnaires were analysed first. They were coded manually as the data was analysed and patterns emerged. These patterns were then arranged using descriptive coding. Once these codes had been set up, they were used to analyse the interviews via the software program NVivo. The coded data from both sources was then sorted into emergent themes depending on the number of times the items appeared in the analysis, as recommended by Schwandt (2001).

The final stage of the data-gathering process for this project depended on the preceding analysis of the first two stages. After conducting the questionnaire, it became apparent that the demographic from the questionnaire was largely made up of secondary and tertiary students, whereas the demographic of the three singers who were interviewed was exclusively professional. At this stage of the data analysis there were divergent themes emerging about the singing techniques and listening experiences of the two groups of recruits. Using the method described by Silverman (2000) as constant comparative method, it became clear that a more even demographic spread was necessary to further test some of the emerging patterns.

Therefore, the decision was made to recruit three singers in secondary training, three singers in tertiary training, and three professional singers to explore some of the trends that were becoming evident from the data analysis of the first two stages. To provide further rigor to the investigations, the researcher decided to recruit a panel of experts to provide a listener's perspective on the nine singers' performances. The role of the panel of experts was to listen to the singers' performances and evaluate the accuracy of the singers' perceptions about their performance.

The researcher developed a second questionnaire using the most effective questions in the initial pilot questionnaire, and this was administered to the nine participants. Each of the participants was required to sing the same song and this was recorded in one session. On completion of this stage, the sung performances were transcribed. The researcher then developed a set of questions about the participants'

performances, and these were put to the panel of listening experts. The purpose of this third questionnaire was to discover whether the listener could identify the vocal choices that each participant used in their performance. Questions concerning register description, style and tessitura were included as part of the design.

The "Qualtrics" online survey software was used to circulate the recording, transcribed performance and questionnaire to the panel of experts. The questionnaire contained five closed questions and two open-ended questions about each participant's performance, which enabled a quantitative analysis to test some of the emerging patterns. Once the survey had been completed, the data was entered into an Excel spreadsheet and graphed. With this final collection, the three studies of the project (Study One - The Questionnaire (data gathered from secondary, tertiary and professional singers); Study Two - Interviews with three Professional Singers and Study Three - The Nine Singers and Analysis) were then compared to test emerging ideas from Studies One and Two of the dissertation.

The final analysis comprised triangulation of the collected data, in which the results from each stage of the project were compared in order to determine whether the emerging themes were attributable to each demographic (Schwandt, 2001; Silverman, 2000).

Ethics

This research project was conducted according to the approved ethics application. No participants required counselling or any other form of support, nor were there any complaints received from the participants in any of the studies. No physical harm or emotional distress was inflicted on the participants during the course of this project.

All data collected were coded to de-identify the participants and then stored in a locked cabinet at Edith Cowan University. This data will be destroyed after a period of five years. All paperwork will be shredded and all the digital files will be deleted and then destroyed.

Study One: Questionnaires

The purpose of the first study was to discover whether professional and pre-professional singers of CCM had a preference when singing in their middle range. In

addition, the researcher sought to identify possible influential factors within the participant's answers. The questionnaires were circulated to secondary students, tertiary students and professional singers (N=57) In order to elicit the most rigorous results, the researcher applied purposive sampling when selecting the participants: "[t]he goal of purposive sampling is to select individuals for case study who are likely to be "information-rich" with respect to the researchers' purposes." (Gall, Borg & Gall, 2005, p. 310)

Of the 100 questionnaires circulated to secondary students, tertiary students and professional singers, a total of 57 questionnaires were returned. Thirty-two of these were secondary students, 11 were tertiary, and 20 were professional singers. The secondary students all took private voice lessons and participated in vocal programs in metropolitan Perth secondary schools. All of these students were studying CCM. Tertiary students were recruited through the Contemporary and Jazz vocal programs at WAAPA. Professional participants were accessed through the researcher's personal contacts and were all performers of contemporary and jazz music. A very small number of the last cohort was mature students who took vocal lessons in the researcher's private studio.

In choosing these specific participants, the researcher was engaging in the practice of purposive sampling. Denscombe writes:

> With purposive sampling the sample is 'hand-picked' for the research. The term is applied to those situations where the researcher already knows something about the specific people or events and deliberately selects particular ones because they are seen as instances that are likely to produce the most valuable data…From the researchers point of view, the question to ask is this: "Given what I already know about the research topic and about the range of people or events being studied, who or what is likely to provide the best information. (Denscombe, 2003, p. 15)

It was believed that this sample of participants, with their training in CCM through secondary and tertiary institutions, would provide the most relevant answers for this project. The professionals in the field of CCM and the few mature students were also considered to be eloquent in their understanding of singing and registration and this was deemed important for the project.

The majority of the questionnaires were distributed manually and the participants filled them out in the presence of the researcher. A small number of

questionnaires were distributed electronically via email correspondence, with the questionnaire attached as a PDF. The participants who received the questionnaires electronically were professional singers living interstate.

The sample size for this study was small-scale with a total of only 57.. Denscombe writes that in such instances "[a] small sample size is quite in keeping with the nature of qualitative data." (Denscombe, 2003, p. 24). The researcher's application of purposive sampling was designed to create rigor in the results from this small cohort (Gall et al., 2005). The researcher considered that as the sample size was small, it became more important to ensure that the participants could contribute relevant data to the research questions (Denscombe, 2003).

Initially the questionnaire consisted of the questions shown in Table 2 (below). These questions were devised to elicit participants' register preference.

Design of questions

Question one was asked first so that the researcher could categorise the participants as secondary, tertiary and professional singers. This was a closed-ended question that was dealing with factual information (Denscombe, 2003).

Question two was designed to identify any cultural differences amongst participants. If there were participants with cultural differences, at this stage of the study, the researcher was open to exploring these differences. However, with only one participant answering yes to this question, this line of research was not taken up. This question was designed as a closed-ended question, as it was dealing with factual information.

Table 2:   Study One Questionnaire

Question 1: What is your age?
Question 2: Is English your first language? (Please circle) i.   Yes ii.   No   b.   If no, which language is your first?
Question 3: Which register do you naturally sing in? i.   chest ii.   mix iii.   head
Question 4: What are your opinions about: i.   chest ii.   mix iii.   head
Question 5: How old were you when you first became aware that you were singing in your chest or head voice?
Question 6: Did your mother sing to you? i.   yes ii.   No Question 7: If so, which register did she sing in? i.   Chest ii.   Mix iii.   Head
Question 8: Name five vocal artists who have influenced you the most in regards to style and creativity expression.
Question 9: Please use one to five words to describe your opinion when hearing someone sing successfully in their head voice?
Question 10: Please use one to five words to describe your opinion when hearing someone sing successfully in their chest voice?
Question 11: Do you feel comfortable raising your voice when the occasion is appropriate? i.   yes ii.   no
Question 12: Would you describe your speech characteristics as: (please feel free to circle more than one) i.   softly spoken ii.   loud iii.   bright tone iv.   nasal v.   mumbling vi.   articulate
Question 13: How would your friends describe your personality in five words?

Question three was designed to find out if there was a preference amongst the participants for singing in a particular register. The introduction of mix register came out of the literature review. The limitation of this question was that there was no "I don't know" option provided. This limitation was then rectified in the final study of the project. This question was closed-ended and it was designed to gather the participants' opinion (Denscombe, 2003). It was determined by the researcher that the participants would have enough understanding of vocal registers to be able to answer this question, through informal discussion between the participant and researcher before filling out the questionnaire, (Denscombe, 2003; Kazi & Khalid, 2012).

Question four was designed to invite the participant to enlarge on their ideas of singing in each register in order to trace patterns in vocal self-identification. It was expected that if a participant naturally sang in chest register, for example, then she might express herself positively when writing about her opinions of chest register. Conversely, it was proposed that a participant might express negative opinions about singing in mix or head register.

Vocal self-identification is described by Chinn (1997) as follows:

> In some studies in which qualitative aspects of voice in adolescent girls were examined, researchers have investigated vocal self-perception, through which the singer monitors her own voice through the senses (sensory monitoring) and identifies with a particular vocal model; this process is known as vocal self-identification. (Gackle, 1987; Haskell, 1987; Williams, 1990; Wolverton, 1988) Vocal self-identification is a learned behaviour and is influenced by vocal models, self-concept, attitude towards one's own voice and cultural values. (Haskell, 1987, p. 637)

This question was open-ended and was designed to gather the participants' opinions about singing in their registers (Denscombe, 2003).

A limitation of this question was that it was not well constructed: some participants answered with respect to themselves singing but others answered with regard to hearing someone else sing. This limitation resulted in the development of two categories. One category was classified as own practice and the other as listening experiences (or others' practice). In this paper the researcher defines practice as "what people do" rather than as the formal, deliberate practice of exercises and repertoire resulting from instruction given in the voice studio.

Question five was designed to gain an indication of the participant's understanding of their own voice, and to determine whether there was any pattern to the age at which singers became aware of vocal registration. Question five was designed to gather facts about the participants in order to determine the level of training they had received (Denscombe, 2003). This question was considered to be particularly important to the research as it referred directly to research question two: "To what extent have training, listening and performance experiences affected this preference?"

Questions six and seven were designed to explore whether there was a relationship between the participant's perception of her mother's use of register and her own. This idea would be explored further in the question about singer identity. Question six was also designed to elicit an indication of how many participants were aware of their mother singing to them. Question seven was intended to elicit a comparison between the participant's preferred register and the register that the participant perceived her mother singing in. This idea of the mother's voice affecting the register preference of the participant was later deemed to be outside the parameters of this project. Both of these questions were closed-ended and designed to gather information about the participants' opinions regarding their experience with music in their youth (Denscombe, 2003).

Question eight was an open-ended question designed to gather facts regarding the participants' listening experience, with the idea of comparing these experiences with the participant's vocal register preferences (Denscombe, 2003).

Questions nine and ten were asked for the purpose of identifying whether there was a pattern in responses that the participant might have when listening to another singer perform in the participant's preferred register. Conversely it was proposed that the participant might provide a negative response to the act of listening to a singer perform in a non-preferred register. These questions were open-ended questions and designed to gather the opinions of the participants.

Question eleven was intended to elicit whether the participant was comfortable raising her voice. Once this had been indicated, the next step was for the researcher to trace this answer back to see whether there was any correlation between the answer to this question and the answer to question four (What are your

opinions about: i. chest ii mix iii head). This question also drew on the literature review in regards to the origins of the belt and legit sounds, and specifically to the *calling out* sound related to the belt vocal production. This question was a closed-ended question and was designed to gather the opinion of the participants (Denscombe, 2003).

Question twelve was a closed-ended question and was designed to draw out any patterns between the participants' perception of their speech characteristics and their answer to Question Four (What are your opinions about: i. chest ii mix iii head) (Denscombe, 2003). This line of analysis was later deemed too broad for this project.

Question thirteen was an open-ended question and designed to gather the opinions of the participants (Denscombe, 2003). The researcher planned to draw out any patterns between the participants' perception of their personality and their answer to Question Four. This line of analysis was later deemed too broad for this project.

An Excel spreadsheet was used to analyse the data collected. Separate spreadsheets were made for secondary students, tertiary students and professional singers. The questions were lined up along the horizontal axis and the participants were listed along the vertical access.

Once the spreadsheets were completed, it became apparent that some lines of inquiry needed to be investigated further. Concepts alluding to vocal identity and personality began to take the research idea down the line of personality types. When the researcher discussed this relationship with experts in the field of psychology and personality types she was informed that categorising register preference against personality type was a complex research topic and lay outside the parameters of a Masters' thesis.

As a result of this advice, the researcher decided to remove some of the questions from the analysis. This included the questions that were designed to elicit a response pertaining to identity and personality. The following questions remained (see Table 3):

Table 3:   Amended Questions for Questionnaires

Question 1: What is your age?

Question 2: Is English your first language? (Please circle)
          iii.   Yes
          iv.   No
     b.   If no, which language is your first?

Question 3: Which register do you naturally sing in?
          iv.   chest
          v.   mix
          vi.   head

Question 4: What are your opinions about:
          iv.   chest
          v.   mix
          vi.   head

Question 5: Name five vocal artists who have influenced you the most in regards to style and creativity expression.

Question 6: Can you use five words to describe your opinion when hearing someone sing successfully in:
          i.   Chest voice
          ii.   Head voice

Three topics emerged from the data that remained. These were:

1.   Performance: Participants commenting on their own performance experience.

2.   Training: Participants commenting on their own vocal training.

3.   Listening: Participants commenting on other singers' vocal performances.

The topics were coded in a numbered spreadsheet:

1.   Performance comments were highlighted yellow.

2.   Training comments were highlighted blue.

3.   Listening comments were highlighted green.

(*NB See Appendices for an example of the coding of these topics.)

Comments were then further broken down into attitudes towards registration and collated in an Excel workbook. A separate workbook was created for the three topics: performing comments, training comments and listening comments. The

horizontal axis was set up with the descriptive coding (outlined below), the criteria, notes on criteria requiring further analysis, participant number and the relevant quote from the questionnaire. The vertical axis was labelled with the variables (See Appendix).

Analysis of the comments showed that the same type of descriptor was used in reference to both vocal production and training. As a result, these two categories were combined. There now remained two workbooks. Workbook one was entitled *Own Practice* and Workbook two was entitled *Others' Practice*.

Each workbook contained three worksheets. One worksheet listed the participants' responses to chest voice, a separate sheet was used for head voice and a separate sheet was used for mix voice. Descriptive coding was used in the next stages of the data analysis (Saladana, 2013). The descriptive coding is listed below.

Degree of difficulty (lack of ease/ease)

Degree of difficulty was applied when participants used the words "easy" or "hard" in their answers. Other adjectives such as "difficult", or phrases such as "I have trouble…", "I find it challenging", "I have less control" were also aligned with "lack of ease". Adjectives such as "relaxing" and "uses less support" were aligned with "ease". Degree of difficulty was coded as follows:

- A = ease

- B = lack of ease

Example of A: one participant referred to the experience of ease when singing in chest register as "comfortable, easy". Example of B: "To me the chest voice is a raw and savage beast that requires taming, and then shaping and coaxing into a smoother product, which takes a lot of time and effort and is best done when the voice has some level of maturity."

Timbre (bright/dark)

Ware describes timbre as "colour or tone-quality characteristics…[as] a product of the glottal source spectrum modulated by the resonance in the vocal tract, which means that a singer's vocal colour is dependent on the unique vibratory patterns of

the vocal folds combined with the distinctive resonating properties of the vocal tract." (Ware, 1998, p.189).

Ware goes on to clarify that "[t]he tone quality produced by heavy mechanism is a rich timbre while the lighter mechanism produces a sweeter tone." (Ware, 1998 p.124). In this instance, Ware uses heavy mechanism as a synonym for chest mix and lighter registration as a synonym for head mix.

In reference to vocal timbre, descriptors such as "deeper" and "dark" were interpreted as the parameter "dark", which is also associated with richness and fullness (Ekholm, 1998). Descriptors such as "bright" have been identified as a characteristic of chest voice by some authors (Bestebreurtje, 2000; Herbst & Svec, 2014).

Timbre was coded as follows:

- C = bright

- D =dark

When a participant was referring to a performer whom she assessed as singing in head register, terms such as "flute like/bright" were coded as C. An example of coding a participant's comment as D occurred when she described the sound as "sometimes very heavy sounding" In this instance the participant was referring to listening to a performer whom she judged to be singing in chest register.

Compass (broad/narrow)

Compass refers to the complete range of the voice, from the lowest note the participant can sing to their highest note. Compass was applied as a criterion when participants discussed a particular register as increasing (broadening) or decreasing (narrowing) their range. When participants were discussing compass they made references such as "[a] strong head voice is important to reach the extremes of your register and expand your range." This was categorized as the use of head register to increase compass and was coded F. When discussing chest register a participant's answer "[l]imits how high one can sing", was given the code E.

- E = narrow

- F = broad

Example of E: "Limits how high one can sing." The participant was referring to singing in chest mix register. Example of F: "It produces that largest range". The participant was referring to singing in mix register.

Tessitura (comfort/discomfort)

Tessitura is defined as the area of the voice that is most comfortable for the singer (Christian & Jan, 2014; Edwin, 2014; Herbst & Svec, 2014; Titze, 2008). This criterion arose out of a common reference to a sense of comfort or discomfort when singing in particular registers. Tessitura was coded as follows:

- G = comfort

- H = discomfort

An example of G coding can be found in a participant's reference to singing in mix register: "I think this is the ideal place for my voice to be." A participant's comment, "I find my voice hurts when I try to belt higher notes in my chest voice", was coded as H for discomfort.

Registration (easy transition/difficult transition)

In establishing the category of "registration", the researcher referred to the ability of the singer to transition from one register to the other. Since most popular songs span a range of one octave or more, the majority of songs require the vocalist to transition from one register to another. Citron (Citron, 2002) writes "[y]et for most songs written today, the rule of keeping within a range of a tenth still applies." (Citron, 2002, p. 196)

Registration was coded as follows:

- I = easy transition

- J = difficult transition

An example of this coding can be found in a participant's comment of, "easy to change from chest to head most of the time," as she was discussing mix register.

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This comment was coded I for easy transition. An example of how the code J was used for comments on difficult transitions can be found in the following: "mix (register) can help to deliver both low and high notes, but is also difficult to manoeuvre."

Skill (competent/incompetent)

Skill was selected as a criterion to illustrate a participant's conscious sense of competence when singing in a particular register, and was coded as follows:

- K = competent

- L = incompetent

An example of how K was used for comments on competence can be found in the following: "Good to use if you know how to use it." In this case, the participant was referring to head mix register. In the discussion of skill the following comment by a participant referring to head mix register, "I don't like it because I don't use it very well," was given the code L.

Significance

The descriptive code of Significance emerged from the data analysis because participants tended to refer to various aspects of register that they deemed important, including classifying one register as more important than another. There were many comments made about the "best" or "better" register to sing in. These were included under Significance (i.e. importance to the participant) and coded as follows:

- M = important

- N = unimportant

A participant's reference to singing in mix register - "It's really hard to achieve for me. But it is important" - is an example of how the code M was used. No participants made any comments that received the code N (i.e. unimportant).

Resonance (resonant/non-resonant)

The use of descriptors relating to "openness" were categorized under "Resonance". The researcher also included comments about "projection" and "placement" under this category since the resonant voice projects and provides the singer with conductive vibrations that can be felt. Musical resonance refers to "the relationship that exists between two vibrating bodies which results in an increase in amplitude and timbre and in a more efficient use of the sound wave" (Doscher, 1994, p. 98). In the case of vocal resonance, the two vibrating bodies are the vocal folds (the primary vibrator), and the air in the resonators of the vocal tract (the secondary vibrator) (Ware, 1998, p.135). Scott McCoy describes the singer's sensation of resonances as follows:

> In reality, placement is an illusion; you can't place the sound in your mask, on your hard palate or through the top of your head…But depending on your personal physiognomy, you might indeed experience resonance or feelings of tone placement in one or more of these regions…While these sensations – caused by forced resonance – can be extremely helpful to individual singers, they are less reliable when used for teaching…[since] no two people share the same body…[O]ne singer's experience of resonance often is very different from that of another, even if both produce similar sounds using the same fundamental vocal technique. (McCoy, 2012, p. 27)

The vibration of air molecules and the reflection of sound waves within a cavity such as the vocal tract is known as "free resonance". "Forced resonance", on the other hand, requires a direct, mechanical connection of the vibrator to the resonator, and in the case of the voice refers to the vibrations often felt by singers in the bony parts of the chest and head (McCoy, 2012, p.27). These vibrations are evident only to the singer and they can be a useful guide to the singer regarding the effectiveness of their phonation (Courlander, 1963; McCoy, 2004).

Resonance is coded as follows:

- O = non-resonant

- P = resonant

There were no participant responses coded as O. An example of how the code P was used can be found the following participant's answer: "resonates with a mixture of

chest and head. When you are in mix you feel [it] as split resonance." This participant was making a reference to singing in mix register.

Sustainability

Sustainability arose from the participants' response to the question about the perception of a particular register as sustainable over long periods of singing. This was coded as:

- Q = sustainable

- R = unsustainable

An example of the use of the code Q can be found in the following comment by a participant referring to mix register: "It is better for sustaining a longer performance". There were no participants whose answers were coded as unsustainable.

Understanding

This descriptive code was used to address the issue of the participants' knowledge of and relationship to each of the registers. It was coded as follows:

- S = confusion

- T = clarity

An example of the use of the code S can be found in the following comment by a participant referring to mix register: "[t]o this day I still feel a sense of confusion. The more I analyse it the less I understand it and yet I think I use it all the time." An example of the use of the code T can be found in the following comment by a participant referring to chest mix register: "[u]nderstanding the heights from the head assists in the lower range."

Intensity

Vocal intensity is the ability to sing loudly, including the vocal style of belting. The criterion of intensity was used as a descriptor for the power that the participants felt was achievable – or felt was lacking – when singing in a particular register.

- U = powerful

- V = weak

An example of the use of the code U can be found in the following comment by a participant referring to chest mix register: "[y]ou get a lot more power in your voice." An example of the use of the code V can be found in the following comment by a participant referring to head mix register: "[h]ead voice is a lot quieter than chest or mix voice."

Phonation

Phonation requires breath flow and two primary actions of the vocal folds: adduction and abduction. Adduction occurs when the vocal folds come together so they meet at the midline, and abduction occurs when the vocal folds are drawn apart. Breath flow builds pressure underneath the adducted vocal folds (sub-glottal pressure). This in turn causes the vocal folds to begin vibrating (Scott McCoy, 2012). Sundberg (2000) states: "[t]he voice source is also influenced by the degree of glottal adduction (the force by which the laryngeal muscles press the vocal folds together)." (Sundberg, 2000, p. 238)

Sundberg goes on to discuss the extremes of phonation as leaky or breathy due to a "low degree of glottal adduction" and its opposite as pressed phonation, caused by a "more forceful adduction" (Sundberg, 2000, p. 238). Simultaneous onset occurs when there is a balance between the breath flow and the vocal fold oscillation, where breath flow and vocal fold adduction begin at the same time so that sound is omitted without a detectable hiss of air or pop of sound (McCoy, 2004, p. 120).

To express these types of phonation in this research project the following codes were used:

- W = breathy

- X = non-breathy

An example of the use of the code W can be found in the following comment by a participant referring to head mix register: "this voice can sound the most airy

out of the three." An example of the use of the code X can be found in the following comment by a participant referring to head mix register: "[r]eally clear".

Expressiveness

This descriptive code was based on how the participant felt they were able to express themselves when singing in a particular register, including the ability to make stylistic choices. Emotional flexibility was evoked in the context of the participants discussing their ability to express the textual content of the lyrics. Expression was coded as follows:

- Y = expressive

- Z = inexpressive

An example of the use of the code Y can be found in the following comment by a participant referring to head mix register: "I think this is the most fragile and pretty of ranges. Singing in head voice is good for when you want to portray feminity [sic] or youthful character." An example of the use of the code Z can be found in the following comment by a participant referring to head mix register: "Whilst I can sing through my whole range in 'head' voice, it sounds pretty empty or soul-less in the lower register."

Style

This descriptive code was introduced to cater for stylistic choices that a singer might make in a particular genre. This refers to choices that would be made for singing in any of the sub-styles of CCM, which include folk, rock, pop and blues, as well as choices that were made for jazz and musical theatre (Lovetri, 2008). Style was coded as follows:

- AA = stylistic

- BB = non-stylistic

An example of the use of the code AA can be found in the following comment by a participant referring to head mix register: "Great for a cappella." An example of the use of the code BB can be found in the following comment by a

participant referring to head mix register: "We don't use head voice as it may sound like European Classical." This participant was referring to singing in a traditional Persian style.

Range

This code was applied to comments that participants made in reference to singing notes that were either low or high in their range.

This was an attempt to confirm the idea apparent in the literature: that chest mix register is most often used for lower pitched notes and head mix register is most often used for higher pitched notes.

Range was coded as follows:

- CC = high

- DD = low

An example of the use of the code CC can be found in the following comment by a participant referring to head mix register; "It is the voice which you hear when you need to sing in your upper register. It helps when you need to reach high notes". An example of the use of the code DD can be found in the following comment by a participant referring to chest mix register; "It brings a nice tone to the lower notes."

Default

Default was used in reference to the participant describing her sense of using her voice "naturally". Default referred to the vocal register that the participant chose to sing in when performing a song that sat in her tessitura. It was coded:

- EE = natural

- FF = unnatural

An example of the use of the code EE can be found in the following comment by a participant referring to chest mix register as "a more natural way for me to sing." An example of the use of the code FF can be found in the following comment

by a participant referring to singing in chest mix register: "low very resonant but I don't feel it's me. Feel like I am putting it on."

Laryngeal tilt

This item was included to address participants who spoke specifically about singing in a speech style. In speech style singing, the larynx is in a neutral position. When the singer is singing in head mix or mix register, the larynx assumes a tilted position due to the action of the cricothyroid muscles. As explained by Leborgne and Rosenberg (2014): "[t]he cricothyroid (CT) is the primary tensor muscle of the vocal fold…contraction of the CT narrows the space between the superior border of the cricoid and the inferior border of the thyroid anteriorly…this narrowing tilts the thyroid cartilage downward." (Leborgne and Rosenberg, 2014, p.54) The researcher decided to use the descriptors "un-tilted" for speech style singing and "tilted" for legit style singing, even though the singer herself may not use these terms or understand the mechanical principles underlying laryngeal tilt. As previously stated, legit style involves the use of the upper register during which time the larynx will be in a slightly lower and tilted position (Bourne et al., 2011). This criterion was coded as follows:

- GG = un-tilted (speech-style singing)

- HH= tilted (singerly style)

An example of the use of the code GG can be found in the following comment by a participant referring to chest mix register; "is similar to the speaking voice". There was no reference to tilted larynx in the data.

Aesthetic preferences

This element emerged from the data as participants expressed their preferences for singing in a particular register. This included their response to feelings of resonance that were expressed as favourable or unfavourable, and incorporated verbs such as "like" and "dislike". Aesthetic preferences were coded as follows:

- II = pleasing

- JJ = non-pleasing

An example of the use of the code II can be found in the following comment by a participant referring to head mix register; "I most enjoy singing in my head register." An example of the use of the code JJ can be found in the following comment by a participant referring to singing in her head mix register; "I resist the area and at times dislike singing soprano because of how 'thin' the sound can be."

Judgement

The Collins online dictionary defines "judgement" as follows: "[t]he faculty of being able to make critical distinctions and achieve a balanced viewpoint; discernment" (http://www.collinsdictionary.com/dictionary/english/judgment)

"Judgement" was used in a question to investigate whether singers were able to cultivate judgements of vocal registers when they were either singing or listening.

- KK = healthy

- LL = unhealthy

An example of the use of the code KK can be found in the following comment by a participant referring to chest mix register; "I tended to overuse before taking lessons." There were no responses that aligned with KK in the data.

Dynamic range (small/large)

Dynamic variances from soft to loud were referred to in this subtopic. This included comments on the participants' ability to express dynamic variances in particular registers.

- MM = small dynamic range

- NN = large dynamic range

An example of the use of the code MM can be found in the following comment by a participant referring to head mix register: "Easy for *piano* and high notes." There no responses that aligned with MM in the data.

Support (greater/less)

Support refers to muscular actions that the participant could detect in the area around her torso, intercostal muscles, upper back muscles or pelvic floor muscles when singing in a particular register. Some participants referred to a particular register as needing more support and this was coded as follows:

- OO = greater support required

- PP = less support required

An example of the use of the code OO can be found in the following comment by a participant referring to head mix register: "Needs lots of support." There were no examples of PP in the data.

The data from the Excel spreadsheets were collated and graphed. These graphs will be reviewed in Chapter Five. The first emerging pattern from the analysis of the questionnaires was that comments made in reference to listening were much less numerous than comments made pertaining to the participants' own practice. Although there was less data collected for listening, it was deemed valuable for comparison with the listening experiences of the three professional singers.

When the two studies were triangulated, it was found that the listening experiences of the respondents to the questionnaires (who were predominantly students) were significantly fewer than the listening experiences of the three professional singers. This point will be further explored in the analysis section of the dissertation.

In the analysis of participant responses regarding preferred recording artists, the researcher acted as expert listener and categorised the artists into their particular areas of vocal register. In other words, the respondents' listening experiences were aligned with their preferred register (please see Table 4 below as an example).

Table 4:   Listening Analysis Cross Examination

Participant	Preferred register	*Singers in chest	*Singers in mix	*Singers in Head
7	Chest	Sarah Vaughn/Shirley Horn/Carmen McCrae/Kristen Beradi	Ella Fitzgerald	
53	Chest	Emma Pask/Carmen McCrae/Diana Krall/Sarah Vaughan	Ella Fitzgerald	
54	Chest	Billie Holiday/Etta James/Alison Mosshart/Frank Sinatra	Ella Fitzgerald	
55	Mix	Lea Salgona/Christina Aguilera/Beyonce/Idina Menzal	Suzie Mathers	
56	Mix	Christina Aguilera/Alicia Keys/Barbra Streisand/Adele/ Beyonce		
11	Chest		Ella Fitzgerald	
22	Mix	Delta Goodrem/Norah Jones/Faith Hill/Eva Cassidy/Adele		
10	Head	Barbra Streisand/Whitney Houston/Frank Sinatra/Etta James	Ella Fitzgerald	
6	Chest	Sarah Vaughn/Kristen Beradi/Megan Washington/Shirley Horn	Ella Fitzgerald	
8	Mix	Paul Kelly/Cassandra Wilson/Paul McCartney/Janis Joplin/Nina Simon/Chet Baker		
24	Chest	Sarah Vaughn/Esperanza Spalding	Ella /Gretchen Parlato	Gian Slater

The purpose of this alignment was to see whether the participants listened to performers who sang within or outside of the participant's preferred register.

Study Two: Three Professional Singers

The purpose of this study was for the researcher to examine the vocal styles and register preferences of three Australian performers through interview, observation of their live performances and analysis of their recorded performances. In the selection process for the three professionals, the researcher sought singers who presented a cross-section of vocal styles and register preferences. The purpose of the interview was to determine whether the singers could articulate their register preferences and to gather an account of the experiences that might possibly have led to this register

preference. Study two related back to the first of the central research questions: "Do female pre-professional and professional singers of CCM express a preference for using either chest mix or head mix in their middle registers?" (p. 3)

This part of the research also related to the second of the central research questions: "To what extent have training, listening and performance experiences affected this preference?" It was hoped that interviews would be an effective way of determining training, performance and listening experiences, as the participant could be asked the question in person and encouraged to account for how she arrived at her register preference. As mentioned above, each interview was structured with the same set questions, combined with spontaneous conversation that emerged on topics of interest and relevance to the research (Olsen, 2012).

The participants

To ensure that each performer's training was substantial, the researcher stipulated that each singer would have a tertiary degree in the discipline of music and that her instrument would be voice. The concept of "professional" was bounded by performance experience as the headline singer at live venues, supported by a band of professional musicians. To ensure that the performance experience was substantial, the researcher decided that each singer would have no less than ten years' performance experience as a professional singer. Each singer was also to have recorded at least one album that could be used for evaluation by the researcher, and for comparison with the answers provided in the interview.

The three singers selected were Subject B, a vocalist from Melbourne, and Subjects A and C, vocalists residing in Perth, Western Australia. All three singers had regular engagements in Perth, which gave the researcher access to their performances. Their biographies are outlined below.

Subject A

Subject A reported:

> I have also noticed a general tension in my throat when listening to other voices. It's as if my voice is always ready to pounce, always ready to react. Genevieve and I watched a Toy Story movie tonight and I found my throat reacting a lot to the Jessie character and also to Woody,

especially when they were yelling and carrying on. Tiring. (Personal communication, July 29, 2015)

Subject A performs regularly throughout her home state and enjoys a well-regarded reputation as a local entertainer. She is also a vocal coach and bandleader. She graduated from the Western Australian Academy of Performing Arts in the late 90s. Subject A has a background in musical theatre, with early performances in professional musical theatre and opera. She has formed many performing ensembles.

Subject A was a vocalist for a jazz orchestra at state level for two years. Subject A has also performed with a state symphony orchestra and with other national and international musicians. She has twenty years' performance experience and has performed nationally and internationally, in Europe and Asia.

Subject A has taught vocal studies at the Western Australian Academy of Performing Arts and currently runs a successful private singing studio in Perth, with a student base ranging from primary school age students to mature-age students, in which she teaches contemporary, musical theatre, jazz and classical voice.

Subject A was chosen as a participant in this project due to her fit with the selection criteria in terms of performance experience, training experience and recorded works. The researcher attended two live performances and listened to a number of recordings that Subject A had made in order to confirm her suitability as a participant. After discussion with the participant the researcher was able to discern that Subject A was highly articulate and knowledgeable on the subject of her vocal technique, training and development. Her ability to articulate her experiences was an important factor in choosing her as a participant for the interview section of the research.

Subject B

Subject B reported:

> I have self-identified with being a soprano over the years...my speaking voice is quite low and I can sing quite low, so I think it has to do with...maybe more the sound that I like or the sound that feels honest, um I think that's why I have more self-identified with it". (Personal communication, September 13, 2013)

Subject B is a national jazz and contemporary vocalist, composer and educator. She currently lectures in voice at various national universities and an international university. Subject B holds a Bachelor of Music Performance and Improvisation with voice as her instrument.

She has released several albums of her own original compositions whilst also performing as a vocalist for other national and international recording artists. Subject B has formed her own choir, whose debut performance gained critical acclaim. The choir has performed on numerous occasions with increasing public profile and critical success. She has also appeared on a well-known children's T.V. show produced nationally.

Subject B has been the recipient of many national music awards for her compositions and album releases. She has recorded with a significant number of Australian and international recording artists and performed live at various music award ceremonies.

Subject B fitted the selection criteria for the three case studies because of her experience in performance, training and public recordings. However, there were further considerations for choosing Subject B for this project, including her extensive experience in teaching, composing and choral direction. She has had training in classical and jazz singing, which also cultivates an understanding of the diverse vocal techniques that each discipline demands. It was anticipated that Subject B would be able to articulate this understanding in an interview format. The researcher noted that reviewers of Subject B's vocal performances have repeatedly remarked on her purity of tone. This use of pure tone was in contrast to the tonal quality used by Subject C, and it was hoped that this difference would ensure diversity of register preferences amongst the three professional singers. The researcher attended two live performances of Subject B and listened to all of her professional recordings to ensure that Subject B would be a suitable participant for this research.

Subject C

Subject C reported: "Oh, I could hear notes that were husky or that weren't coming out properly but... I was just so used to that sound". (Personal communication, July 30, 2012)

Subject C has had an internationally successful career spanning contemporary and jazz. She studied voice at the Western Australian Academy of Performing Arts and graduated in the early 1990s. She has performed as a vocalist with local orchestras as well as national and international recording artists. She continues to have regular gigs nationally and internationally.

During the 1990s Subject C performed as a vocalist with an international band who experienced great commercial success with a chart-topping hit. This experience allowed her to perform extensively throughout Europe, and Asia. The group produced another four top 40 chart releases and released an album to critical acclaim. The group supported many international contemporary artists. Currently, Subject C's vocal repertoire includes Latin, Lounge, Easy Listening, Motown, Soul, 70s Pop, Disco and Jazz. Subject C recorded a jazz album, which was released internationally and received positive reviews. Subject C has worked as an educator at the Western Australian Academy of Performing Arts teaching voice.

Subject C fits the selection criteria for this study of the project due to her extensive training, international performance experience and recorded works. Of particular interest to the researcher was her wide performance experience in the styles of CCM. Her experience within the industries of contemporary and jazz music has enabled Subject C to acquire an understanding of style and singing technique that spans various genres under the umbrella of CCM.

It was anticipated that Subject C would be able to articulate this understanding in an interview format. Her experience as an educator was valuable as it added to her expertise in dealing with other singers and the possible issues that they might confront. It was presumed that this knowledge would be useful for this project.

It was observed by the researcher that Subject C primarily used her middle range in performance. This observation was made after attending two live performances and listening to numerous professional recordings. This preference

seemed likely to provide a suitable contrast with the other two participants involved in this study.

Questions for interviews with subjects A, B and C

See Table 5 below for the schedule of questions asked of the three vocalists:

Table 5:   Questions for Interviews

What vocal register do you sing in the most?
Can you name one of your first vocal influences?
What were the vocal qualities that attracted you to that person?
What vocal register do you enjoy listening to the most?
How do you feel about listening to a singer sing in your least favored vocal register? While listening, do you notice any particular physical or emotional responses?
Do you feel that you have a different identity between your chest voice and head voice?
Can you tell me how you feel when identifying with your head?
Can you tell me how you feel when identifying with your chest?
Why do think you prefer to sing in your _____ register?
Do you think there is a common denominator between the type of person who sings in her chest and the type of person who sings in her head?
Can you outline your regular warm-up routine?
Can you outline any exercises in your warm-up routine that you think are genre specific?
What, if any, are the signs of vocal fatigue for you?
How do you counteract those signs?
What dietary, if any, disciplines do you undertake when you are performing?
Have you ever had issues with your vocal health?
What was the cause (if known)?
What were the steps for cure?

Study design for interviews with subjects A, B and C

Question one of the interview emanated from research question number one: Do female pre-professional singers (i.e. in training) and professional singers of

contemporary, jazz and music theatre music express a preference for using either chest mix or head mix in their middle register?

Question two was designed to elicit possible vocal influences. Question three was intended to seek out a possible relationship between the vocal influences of the singers' listening habits. For example, would a favoured singer make a stylistic impression on a vocalist, or an impression in terms of register preference, and could these be linked? Question four sought a possible relationship between the singer's listening and register preferences.

Question five was developed to elicit a response to the participant's least favoured register. Part two of question five was asked with the aim of seeking out a possible physical response to listening to the least favoured register. This question explored a possible correlation between a singer's tensions when listening to her least favoured register and tensions when performing in her least favoured register. Question six was developed to further explore the assumption behind research question one: Do female pre-professional (i.e. singers in training) and professional singers of contemporary, jazz and music theatre musical styles express a preference for using either chest mix or head mix in their middle voice?

Questions seven and eight were developed in order to elicit responses that could be further compared against the other participants and to seek out a possible pattern or trend in bias towards favoured or non-favoured registers.

Question nine was developed to encourage the participant to identify any factors that may have influenced register preference that had not been considered in the previous questions. Question ten keyed into one of the initial areas of interest of this project: the issue of personality types. This correlation between personality traits and register preference was later abandoned because further discussion with experts in the field of psychology indicated that it was inappropriate for the purposes of this thesis and for the researcher's level of knowledge and training in this area.

Question eleven was developed to trace a possible relationship between the vocalist's warm-up routine and register preference to see if any possible correlation existed, for example warming up the lower register to a greater extent than the higher register when there was an established preference for the chest register.

Question twelve was developed to rule out exercises that were related to style rather than to register preferences. Question thirteen was developed as a pedagogical reference. It was also designed to trace any common themes of the types of vocal fatigue that may be acquired from a specific register preference. Question fourteen was designed to seek out the vocal adjustments and treatments that a participant may make to counteract signs of fatigue. This would include any adjustments to the use of register.

Question fifteen was developed to seek common dietary habits of performers. This was developed out of the researcher's own personal experience and observations on dietary restrictions that colleagues would make when preparing for a performance. Question sixteen was developed to elicit a response from the participant that could later be traced to common problems with registration preference.

Question seventeen aimed to ascertain if there was any commonality with regard to vocal problems. Question eighteen was designed to trace the means by which the participants overcame their vocal issues. It was of interest to the researcher to monitor whether any changes in register preferences were involved in this process.

The interview questions were first trialled with two pilot studies. The pilot studies were conducted with personal contacts of the researcher, both of whom satisfied the selection criteria used for the three case studies. During the pilot studies carried out for the interviews, the researcher determined that most of the questions asked were suitable and did not require editing. However, the researcher noted that there was a need to avoid too much divergence from the schedule.

This realization came about due to the tendency for the interviewer and interviewee to continue the conversation past the point of the original objective into topics, which were equally interesting and valid, but were unrelated to the subject of this thesis. Carrying out the pilot questionnaires alerted the researcher to the need to stay on topic.

The interviews with subjects A, B and C

Each interview took place at a location and time that were convenient to the interviewee. Subject C's interview was held in her office at WAAPA. Subject B's

interview was conducted at a local café whilst she was in Perth for teaching, lecturing and performance work. Subject A's interview was conducted at her house in Perth. During all the interviews a microphone was positioned between the researcher and participant, and an audio recording was made of the entire interview using the same Zoom H1 handy recorder, which holds two unidirectional microphones positioned at a ninety-degree angle to each other. The microphone contains a micro-SD card reader that was then inserted into the researcher's laptop and played through the laptop speakers for transcription. The transcriptions were coded with identifying details removed, then imported into NVivo as PDF files.

As mentioned above, the next stage involved coding the transcripts using an NVivo tool called nodes. A node is a particular research idea that contributes to the central research question. When a participant discussed a particular idea in their answer, this quote was gathered and placed in a node that corresponded to that idea. The nodes were developed from the 21 criteria used in the analysis of the questionnaire from Study One (see Table 6 below).

Once the nodes had been developed, the interviews were coded and a comparison table was made for each vocalist in an Excel spreadsheet. This was then converted into graphic format. The resulting tables were then compared between each singer. An example of the comparison tables is seen in the Appendix.

Table 6: Categories of Nodes Used to Analyse Own Performance Practice and Others' Performance Practices

Degree Of Difficultly
Timbre
Compass
Tessitura
Registration
Skill
Significance
Resonance
Sustainability
Understanding
Intensity
Phonation
Expressiveness
Style
Range
Default
Laryngeal Tilt
Aesthetic Preferences
Judgement
Dynamic Range
Support

Study Three: Analysis of Recorded Performances

As outlined above, Study Three was undertaken as a result of the perceived limitations of the questionnaire in Study One. The demographic in this study consisted of three secondary singers who were currently training in upper-level music specialist programs in Contemporary Music, three tertiary singers who were studying at the Western Australian Academy of Performing Arts in a CCM genre, and three professional singers who performed in a CCM genre.

These nine singers were recorded performing a song and were then asked to answer a questionnaire. Five expert listeners were recruited to analyse the recordings in order to trace any register preferences in the singers' performances. The expert listeners were teachers and vocal pedagogy researchers in the field of CCM, all of whom were working in tertiary institutions around Australia. The results of the listeners' analysis and the participants' questionnaires were cross-referenced. An example of the tables that were cross-referenced can be found below. Further tables of each candidate will be detailed and explained in Chapter Four.

Research question

In this third study the researcher addressed Questions One and Two of Study One:

1. Do female pre-professional (i.e. singers in training) and professional singers of contemporary, jazz and music theatre musical styles express a preference for using either chest mix or head mix in their middle voice?

2. To what extent have training, listening and performance experiences affected this preference?

However, unlike this study, she also addressed the third research question: "Can a singer's register preference be traced in performance?"

Song selection

The choice of song was based on the following considerations:

- The range should be more than one octave so that the singer has the opportunity to change their registration;

- The range of the song should be within an octave and a half so that the singer is not forced to sing outside of her vocal range;

- The tessitura needs to sit in a moderate area of the female range so that the singer is able to perform the song comfortably. Ware describes tessitura as, "the comfortable pitch level a singer can sustain for a prolonged period without obvious strain." (Ware, 1998, p. 190) It was therefore felt by the researcher that if the singer was able to perform the song in a comfortable key, then they will most likely be singing in the middle range of their voice;

- The song can be sung in a number of genres so that it is not limited in terms of stylistic interpretation;

- The degree of difficulty of the song is low to moderate so that the singer is not restricted by technical demands;

- The form of the song is not too complex so that the singer can learn it quickly and without teacher instruction.

Degree of difficulty was considered to be the most important criterion because of the wide range of level of participants, which included secondary students to professional performers. It was decided that a moderate degree of difficulty would be most suitable. In order to select a song that would enable the singer to interpret the song freely, but would have a broad enough range to challenge the singer to access her full voice, the following recognized music boards were consulted: the Australian Music Examination Board, the Australian and New Zealand Cultural Arts Music Examinations, Trinity College London, and the Associated Board of the Royal School of Music. Once the major examination boards were approached, a known Index measuring this variable (The Ralston Repertoire Difficulty Index) was applied.

Approaching these examination boards enabled the researcher to understand the selection criteria for their respective examination purposes and the allocation of songs to particular grades, which assisted the researcher in selecting a song for this research project. The Associated Board of the Royal School of Music proved unsuitable because its singing syllabus is exclusively Classical, which did not serve the purpose of this thesis. A number of attempts were made to contact Trinity College examination board, however, no reply was received.

A phone conversation with a representative from the Australian and New Zealand Cultural Arts Music Examination administration yielded advice that examiners determined the song lists according to song popularity and difficulty. The examiners took into consideration suggestions made by teachers writing to the board (Hodgson, S. personal communication, February 29, 2016, 2.30pm).

A representative from the Australian Music Examination Board (AMEB) stated that to choose songs for examination they appointed a syllabus consultant, who with two or three co-consultants would oversee the entire syllabus development. The basis for selecting repertoire would be to consider and debate the technical skill level that would be required across the grade. This would include the ranges appropriate to each grade, vocal agility and "various other benchmarks." The representative stated: "to my knowledge, none of our consultants have used an indexing tool as such" (Hodgson, S. personal communication, February 29, 2016, 2.30pm).

The next stage involved trawling through the examination repertoire lists in order to find a song 'in common' which would illustrate a level of difficulty suitable for this study. Grades Four and higher were consulted, as a certain degree of difficulty was desired.

The song that the researcher eventually selected was "Scarborough Fair". This was chosen because it could lend itself to various stylistic interpretations, thereby allowing the vocalist to express herself freely. Free expression was deemed important, since the goal of the exercise was for the singer to express herself as honestly and truthfully as possible.

Further to this aim, the researcher elected to choose a song of moderate difficulty, because the aim of the case study was to examine registration and not technical development. It could be argued that registration equalisation arises from technical development, however, the purpose of this study was to determine registration preference before and above technical development.

"Scarborough Fair" is listed on the following exam syllabuses:

- ANZCA (Australian and New Zealand Cultural Arts Limited) - Preliminary Grade;

- Trinity Rock and Pop Vocal Syllabus - Grade Four;

- AMEB (Australian Music Examination Board) Classical Syllabus - Grade Four.

AMEB have included the following notes for "Scarborough Fair" within their syllabus:

> The song refers to a fair originally held in the English seaside town of Scarborough in the Middle Ages. The song regained popularity in the 1960s, when Martin Carthy taught it to Paul Simon, who subsequently featured his version as part of the soundtrack to the movie *The Graduate* in 1968. The song tells the tale of a young man who asks his former lover to perform a series of impossible tasks, such as making him a shirt without a seam. The refrain 'parsley, sage, rosemary and thyme' is typical of many ancient European folksongs that enumerate herbs and spices, perhaps as a kind of spell. The simplicity of the song, and this refrain, should be paramount in the performance. In particular, the third phrase needs to be well supported to ensure its tessitura doesn't lead to a disproportionate increase in dynamics. (*Singing High Voice Fourth Grade*, 2010)

Once the song was selected, the researcher used the Ralston Index to analyse the song choice (see the Ralston Repertoire Difficulty Index in the Appendix). The Ralston Index was chosen because of its suitability for testing solo songs and grading them on their degree of difficulty (Ralston, 1999). Since very few instruments for measuring song difficulty are available, this instrument was deemed to be the most suitable. Table 7 below outlines the application of the Ralston Repertoire Difficulty Index to "Scarborough Fair".

Table 7:   Ralston Index Applied to "Scarborough Fair"

The Ralston Repertoire Difficulty Index (RRDI) according to Scarborough Fair
Range Easy: Song range is limited to a major 9th.
Tessitura This will depend on the key that the song is performed in. It is expected that it will be in a comfortable key for the vocalist according to their range.
Rhythm Easy: The rhythm is uncomplicated and symmetrical.
Phrases Moderate: The phrases are on average 4 bars long
Melodic Line Easy: The melodic line is simple, diatonic, with conjunct intervals, and the setting of the words is syllabic.
Harmonic Foundations Easy: This includes triadic accompaniment with a few nuances.
Pronunciation Easy: Pronunciation of consonants and vowels, individually or in combination, is relatively simple with regard to tempo, vocal placement and repetition.

Recording the nine participants

The recording of the nine vocalists took place at the recording studio at WAAPA on Saturday 23 April 2016. The sound engineer was a second-year student of Sound Engineering and Design at WAAPA. The studio was treated and had about a half-second delay on sound. The flooring was vinyl/linoleum and the vocalists stood on carpet to reduce foot noise. The vocalists stood eighty centimetres to one metre away from the microphone so that slight movements would not have an impact on the vocal quality of the sound recording. It is important to note that this distance is irregular from normal recording techniques whereby the vocalist would stand much closer to the microphone. The reason that this distance of eighty centimeters was established was so that no vocalist was using the microphone as a tool for vocal production, but rather, the microphone was capturing the acoustic voice for further examination. There was a vocal shield in front of the microphone to cut down as much of the room sound as possible. The brand of the vocal shield was Primacoustic and the model was Voxguard. The microphone used was an Audio Technica 4050 condenser microphone, with a cardio polar pattern with a low cut of 80 Hertz (Hz) at

12dB per octave. The vocalists were recorded into a Pro Tools HD 12 system and the pre-amp used was a Radial workhorse pre-amp rack with the millennia HV 35 pre-amp. The vocalists did not use headphones during the recording process.

The vocalists were recruited for this project via the researcher's personal contacts. Three secondary students, three tertiary students and three professional singers were selected for an even spread of training level.

Criteria for selection of the secondary students were:

- the students were in their final years of secondary education (Years 11 and 12);
- the students were studying a Contemporary Music syllabus for the Western Australian Certificate of Examination (WACE).

These conditions ensured that the selected participants had received the highest level of training in a secondary environment to allow for the greatest development of their technical expertise for the purposes of this study.

Criteria for selection of the tertiary students were:

- the students were undertaking studies in CCM performance.

All the tertiary students recruited were enrolled at the Western Australia Academy of Performing Arts. Two students were enrolled in music theatre courses: one was a first year student of the three-year Bachelor of Arts (Music Theatre) course, and one was a Certificate IV Music Theatre student. The third student recruited was a first year Jazz Studies student in the Bachelor of Music (Jazz Performance).

Of the three professional singers recruited, two were lecturers at WAAPA within the Jazz area of the Music Department and were regular performers in the jazz circuit in Western Australia. One of the singers also taught in the Contemporary area of the Music Department at WAAPA. The third professional vocalist performs in the folk music circuit of Western Australia and is a contemporary vocal tutor in secondary schools.

All participants were given the same sheet music of "Scarborough Fair" in the same key, as illustrated below.
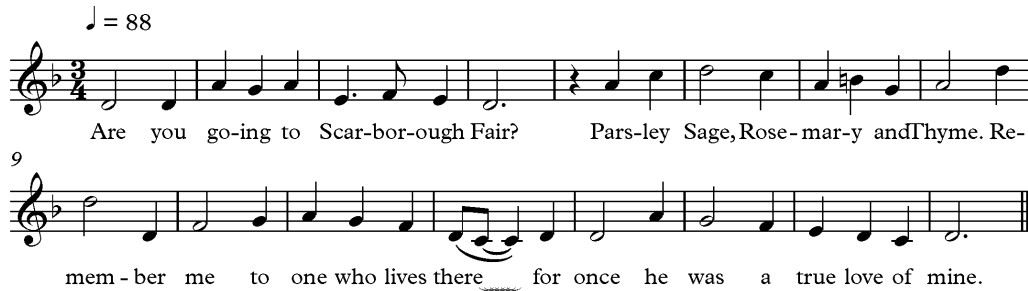
Scarborough Fair

Figure 2. "Scarborough Fair"

       The participants were given the following instructions:

1. Please find attached the sheet music for "Scarborough Fair."

2. Choose a key that you feel sits in your tessitura.

3. This song will be recorded unaccompanied.

4. Please sing all three verses of the song.

5. Please interpret and sing this song according to your particular vocal style.

       The vocalists recorded their song approximately three times in the studio and then chose which recording they would like to submit for analysis. The vocalists then answered the following questions upon completion of their recording session:

1. In which key did you choose to sing this song?

This question was asked to determine which register the song was sung in. From this information the song could be more accurately transcribed and the tessitura of the piece determined.

2. Which register did you use for the higher notes in this song?

This question was asked so that a juxtaposition could be made between the register that the singer described and the register that the expert listener determined.

3. Which register did you use for the lower notes in this song?

This question was asked so that a juxtaposition could be made between the register that the singer described and the register that the expert listener determined.

4. In what parts of the song did you feel you were singing *forte*?

Again, this question was asked so that a comparison could be made between the singer's experience and the listeners' experience.

5. In what parts of the song did you feel you were singing *piano*?

Again, this question was asked so that a comparison could be made between the singer's experience and the listeners' experience.

6. Which register do you prefer to sing in?

This question was asked in direct relation to question three of the central research questions: "Can these preferences be traced in recorded performances."

7. Why do you think you prefer to sing in this register?

This question was asked in direct relation to question two of the central research questions: "To what extent have training and performance experiences affected this preference?"

8. Who are your vocal influences?

This question relates to question two of the central research questions in the area of listening experiences: To what extent have training, listening and performance experiences affected this preference?

After the singer had selected the recording and answered the questionnaire, she was given a participant number. The number that was allocated was determined by the order of the singers' recordings. Therefore, Participant 1 recorded the first session of the day, Participant 2 recorded the second session of the day and so on. The participants' answers were tabled for comparison, with a separate table used for each participant so that the data could be compared with the expert listeners' responses.

Panel of experts

Once the recordings were finalised, an online survey was developed using Qualtrics software. This survey was distributed to five expert listeners who were specialist voice teachers in CCM. The members of the panel were initially contacted by email to assess their interest in participating in the survey. Once the five members had returned an email confirming their willingness to participate, they were sent a link to the Qualtrics survey.

Each vocal recording was inserted into the questionnaire. The quality of the recording was kept as true as possible to the initial recording studio quality by uploading the recording into Sound Cloud as a private playlist and then inserting this file into Qualtrics. The recordings were formatted as wav files. Each recording was transcribed and the transcription was inserted into the questionnaire below the recording. The dynamics of each song were determined by the two transcribers and then marked for the expert listeners to refer to. Each bar was numbered to ensure that the listeners were directed to the specific part of the recording that was referred to in the questions. This decision was made to reduce subjectivity.

The following details were given to the panel of experts:

Panel Instructions

This survey involves listening to nine vocalists performing an *a cappella* version of "Scarborough Fair", then answering several questions relating to each performance.

On each page you will find three sections:

1. A recording of the participant's performance.

2. A transcription in score format of the participant's performance.

3. Seven questions, mostly in multiple-choice format.

All the recordings were made in the same recording studio by the same technician. The participants were given the following set of instructions:

1. Please find attached the sheet music for "Scarborough Fair."

2. Choose a key that you feel sits in your tessitura.

3. This song will be recorded unaccompanied.

4. Please sing all three verses of the song.

5. Please interpret this song according to your particular vocal style.

For the purposes of this study I used the following terminology to describe the registers of the female voice:

1. head mix - referring to CDP.

2. chest mix - referring to TDP.

3. mix voice - neither CDP or TDP but an equal mix of the two registers.

Please answer all questions to the best of your ability.

Please indicate your agreement to continue this analysis and submit your results anonymously by clicking the "I agree" button below.

The following questions were asked of the panellists:

1. Which vocal register is used most in this performance?

This question was developed to compare the vocal register described by the singer and the register determined by the listener. The comparison between the answers to

this relates directly to question three of the central research questions: "Can these preferences be traced in a recorded performance?"

2.   Can you describe the register that is used for the highest notes in this song?

This question was developed in attempt to elicit a common use of registration for high notes in response to findings from Study One that the head mix was used most commonly for high notes. The answers that the participants gave for this question were compared with the answers the listener gave, in direct relation to question three of the central research questions: Can these preferences be traced in recorded performance?

3.   Can you describe the register that is used for the lowest notes in this song?

This question was asked in an attempt to back up the findings in Study One that the chest mix was used most commonly for low notes. The answers the participants gave for this question were compared with the answers the listener gave, in direct relation to question three of the central research questions: Can these preferences be traced in recorded performance?

4.   Can you describe the register that is used at bar/s (bar number/s given)?

Bar numbers were given for a phrase or a note that was sung *forte*. Dynamic markings were made on the score for the listener to observe. For the purposes of rigor, the listener was directed to the bar number rather than determining for themselves the section of the song that the singer performed in a *forte* dynamic, so that each listener was referring to the same section of the song.

5.   Can you describe the register that is used at bar/s (bar number/s given)?

Bar numbers were given for a phrase or a note that was sung *piano*. Dynamic markings were made on the score for the listener to observe. For the purposes of rigor, the listener was directed to the bar number rather than determining for themselves the section of the song that the singer performed in a *piano* dynamic, so

that each listener was referring to the same section of the song. This question arose out of the Study One analysis, as it emerged that participants tended to use their head mix for *piano* dynamics.

6. Do you think that the key chosen by the participant matches the singer's tessitura; in other words, does it sound comfortable?

This question was developed to compare the singer's choice of tessitura and the listener's opinion, in order to determine whether the singer's perspective of comfort matched that of the expert listener.

7. Can you detect any vocal styles?

This question was in direct relation to question three of the central research questions: Can these preferences be traced in recorded performance?

The survey was designed so that the expert listeners had to answer each question before moving on to the next question in order to ensure a complete set of responses for analysis.

Once all the surveys had been returned, the responses were entered into an Excel workbook. A separate sheet was assigned for each participant. The questions were listed along the vertical axis and the respondent's answers were listed along the horizontal axis, as in the table below. These results were then converted into a chart for comparison against the participants' answers (see Table 8).

Table 8:   Survey Analysis Excerpt

Question	Number of Respondents	Head Mix	Chest Mix	Mix	Don't Know
Which vocal register was used the most in this performance?	4	1	0	3	0
Which register was used for the highest notes in the song?	4	1	0	3	0
Which register was used for the lowest notes in this song?	4	1	0	3	0
Which register, which was used for the note C5 at bar 6?	4	1	0	3	0
Which register which was used at bars 32-33?	4	1	0	3	0

In this thesis the researcher examined use of the middle register of the female voice in CCM through three studies. These studies were an attempt to discover how female singers relate to their middle register and whether they have a preference for chest or head voice when singing in this range. The researcher's interest in this area of the voice stems from her experience as a teacher of CCM and from an awareness of an apparent gap in the literature on the treatment of the middle register in CCM.

In summary, this chapter describes the methods and methodology that were used to carry out this project. IPA methodology for qualitative research was discussed and the methods employed (interview, questionnaires, participant observation and listening analysis) were presented. Descriptive coding was applied to analyse the data that were collected from the three studies and the codes were outlined.

In the following chapter the researcher will outline the results of these studies. Topics that emerge from each study will be discussed in further detail. These results will be linked to the research questions and implications for the singer and the teacher will be discussed.

CHAPTER FOUR: RESULTS AND ANALYSIS

In this chapter the researcher presents the results for each study and describes the methods that were used for the organization and analysis of the data. The data were entered into an Excel spreadsheet and into the NVivo software program, and the results were graphed to give a clear visual description. Each study was compared with the others to explore further patterns. The patterns and ideas were then noted for further discussion in Chapter Five.

The results of Study One, which included the questionnaire circulated to secondary and tertiary voice students and professional singers, were tabled in an Excel workbook and these results were then graphed. The results were grouped into two major categories: the participants' own vocal performance and the participants' listening influences. Each of the descriptive codes was graphed separately and explored in further detail.

The results for Study Two, which included the interviews with three professional singers, were summarised in an Excel chart. The results were grouped into two major categories: own practice (performance) and others' practice (listening experiences).

In Study Three the results of the participants' questionnaires were tabled and compared to the expert listeners' results. The expert listeners' results were entered into an Excel sheet and graphed so that a visual distinction could be made. The graph for each participant listed the number of total respondents and a further breakdown of how the expert listeners responded individually.

The dominant subtopics from Study One revealed a small number of listening experiences, in contrast to the participants of Study Two, who discussed their listening experiences extensively.

Study One: Questionnaires

Study One Analysis and development of own practice
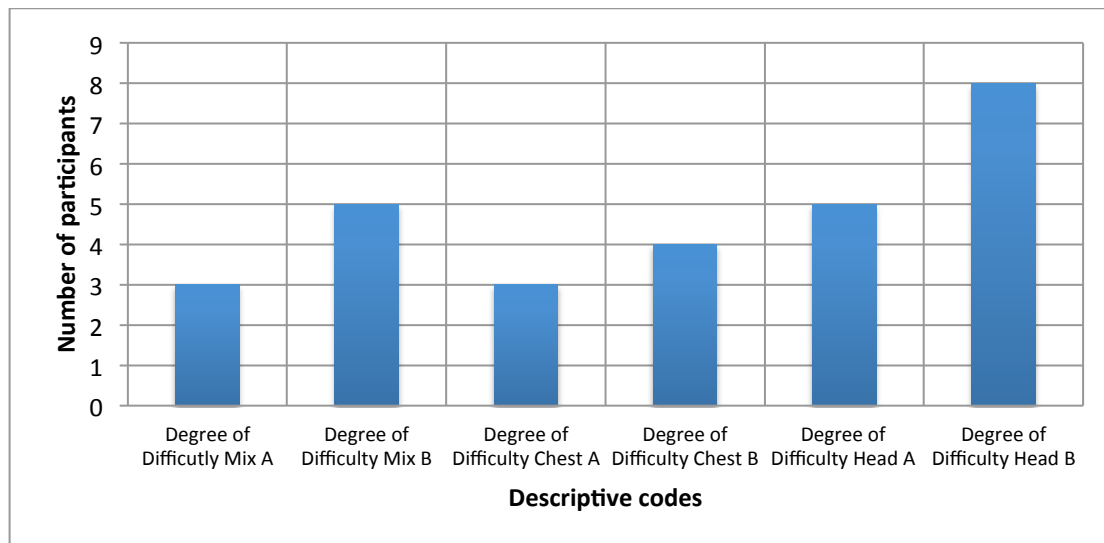
Degree of Difficulty

Figure 3. Own Practice: Degree of Difficulty

Twenty-seven participants out of 57 (i.e. 47% of participants) referred to ease or lack of ease, and described a particular register as being either easy or hard to produce (see figure 3). Only one of these participants described more than one register as easy. All other participants identified a register that was easier to sing in and a register that was harder to sing in. This observation leads the researcher to believe that ease of singing was an important issue for the participants. If ease is important to the singer, it could be worth considering whether a singer might favour the register that they found easiest to sing in.

Five participants referred to mix register as produced with a lack of ease and three participants referred to mix register as easy. Four of the participants (7%) referred to chest register as difficult to produce, whereas two participants (3.5%) referred to chest register as easy. Eight participants (14%) referred to head register as produced with a lack of ease, and five participants referred to head register as easy.
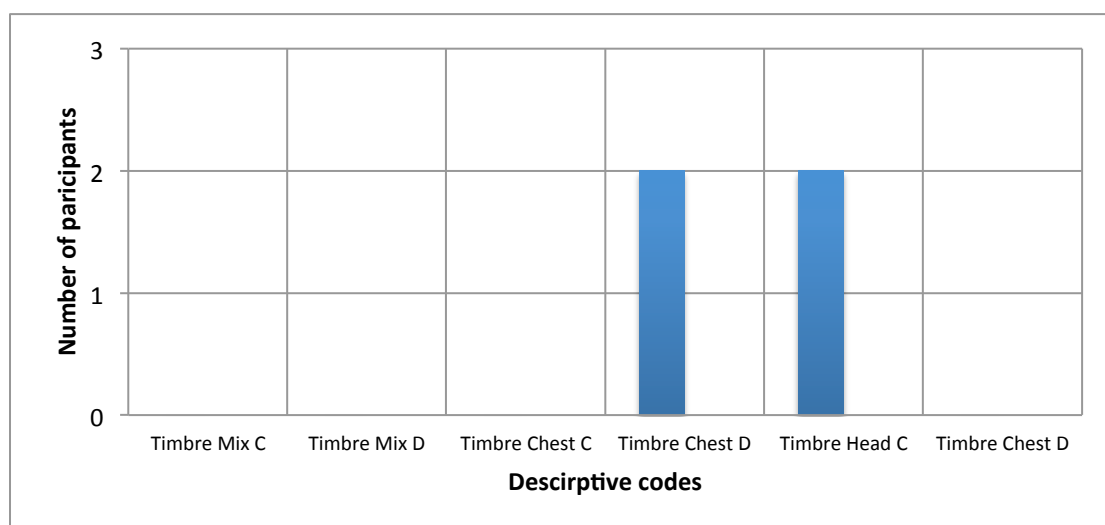
Timbre

Figure 4. Own Practice: Timbre

Only four participants (7%) referred to timbre in their discussion of chest and head registers (see figure 4 above). No participants used a description of timbre when they were discussing mix register. Two participants (3.5%) referred to chest register as having a bright timbre and two participants referred to head register as having a dark timbre.
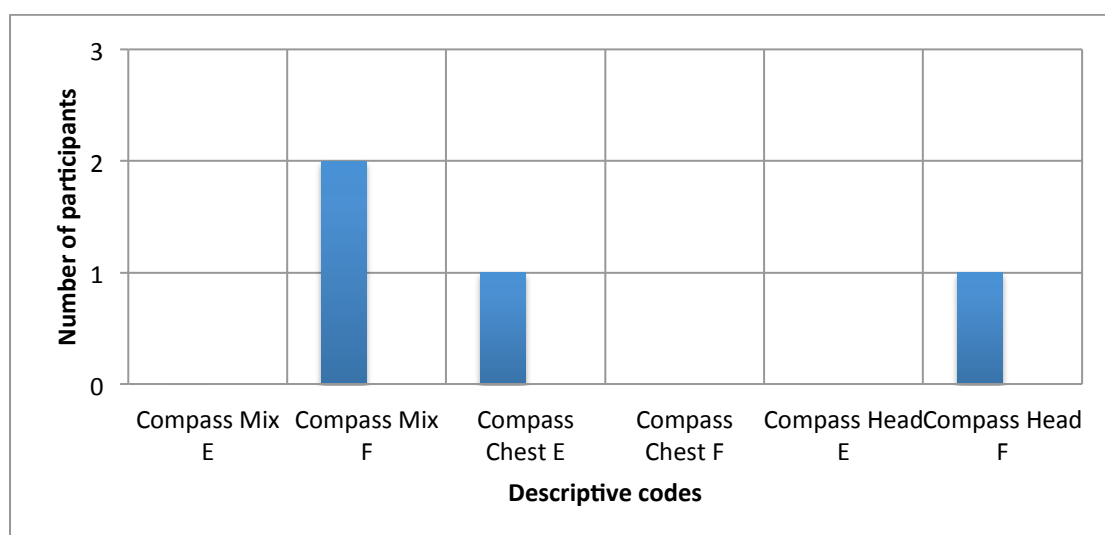
Compass

Figure 5. Own Practice: Compass

Two participants (3.5%) claimed that mix register allowed them to sing with a broader compass (see table 5).

One participant claimed that chest register narrowed her range. One participant claimed that head register allowed her to sing with a broader compass.
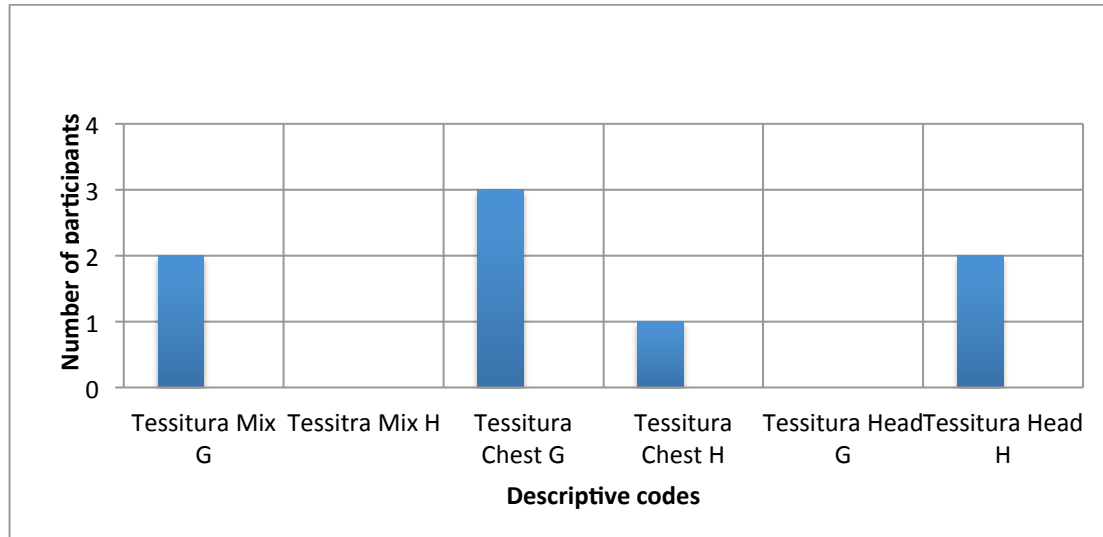
Tessitura

Figure 6. Own Practice: Tessitura

Eight participants (14%) referred to tessitura in terms of comfort or discomfort (see figure 6). Two stated that mix register was comfortable. Three participants asserted that chest was comfortable for them to sing in and one that chest register was limited to "how high one can sing". Two participants stated that head register was uncomfortable for them and felt too high. This could lead one to conclude that comfort is a consideration when it comes to a singer choosing a particular register in which to sing.
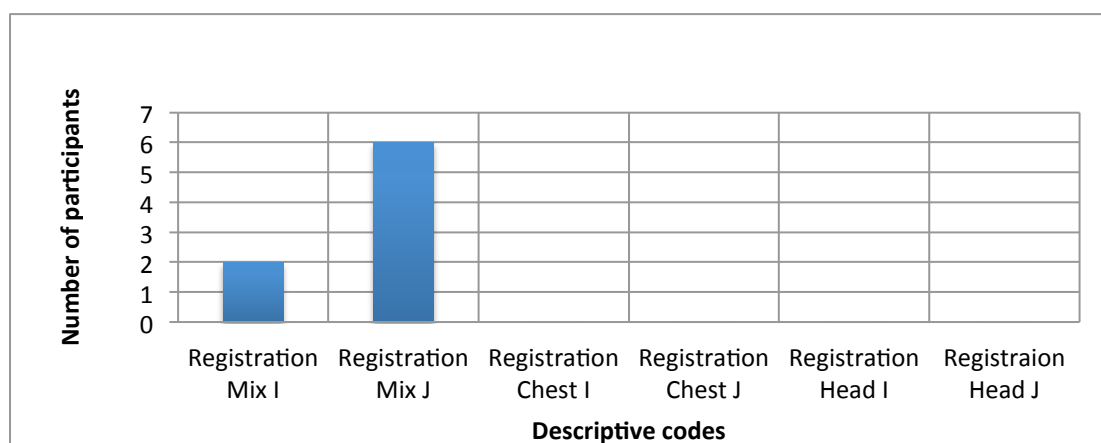
Register Transitions

Figure 7. Own Practice: Register Transitions

Eight participants (14%) commented on register transitions, and all of these comments were in reference to mix register (see figure 7). Two participants (3.5%) stated that they found it easy to transition from mix register into either chest or head, and six (10%) stated that they found it difficult to transition. This could show that mix register is considered by the participants to be useful for transitioning from their chest register to their head register.
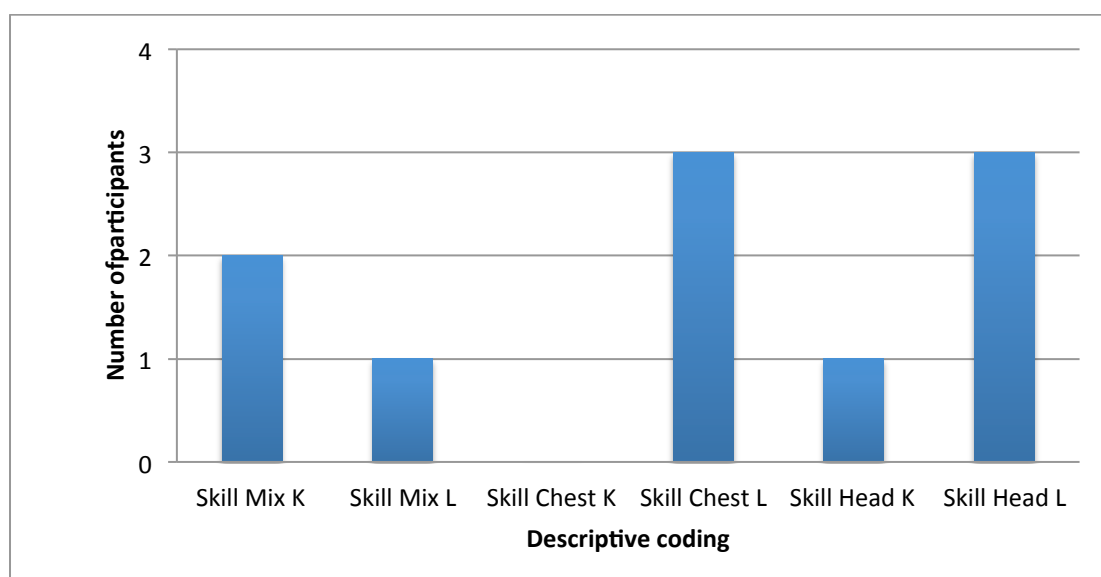
Skill

Figure 8. Own Practice: Skill

Ten participants (17.5%) referred to skill levels when discussing their vocal production, with three participants remarking that they were competent, and seven

claiming incompetence (see figure 8). Two participants (3.5%) stated that they possessed skill when singing in mix register. One singer claimed that she lacked skill when singing in mix register. No singers stated that they were skilled at singing in their chest register. Three participants (5%) claimed to lack skill in this register. One singer remarked that she was skilled at singing in her head register, whereas three singers (5%) stated that they lacked skill when singing in head register.
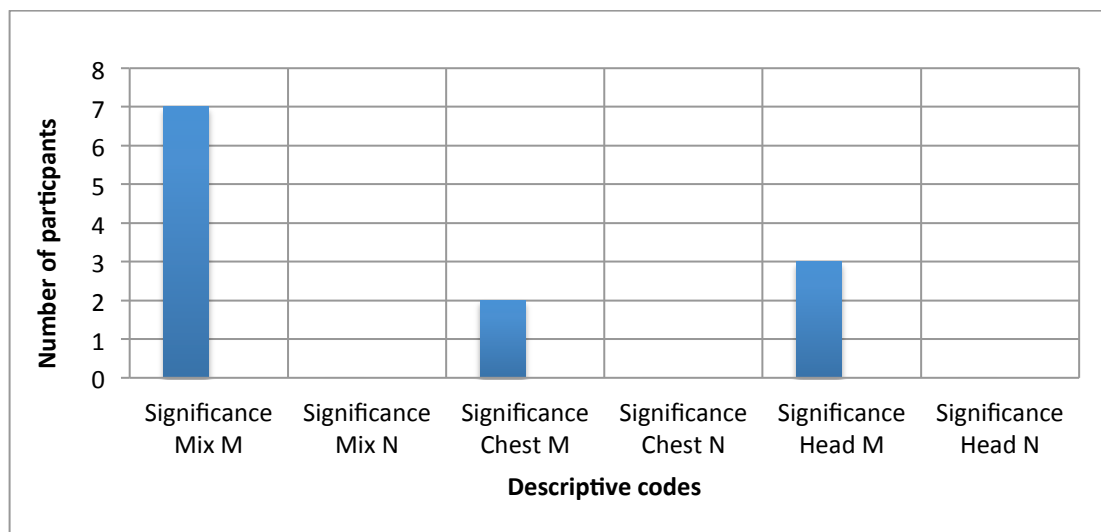
Significance

Figure 9. Own Practice: Significance

Twelve participants (21%) commented on a particular register being important to them (see figure 9). Seven participants (12%) asserted that mix register was important, whereas two participants referred to chest as important. Three participants (5%) referred to head as important. No participants commented on a register as unimportant.

Resonance
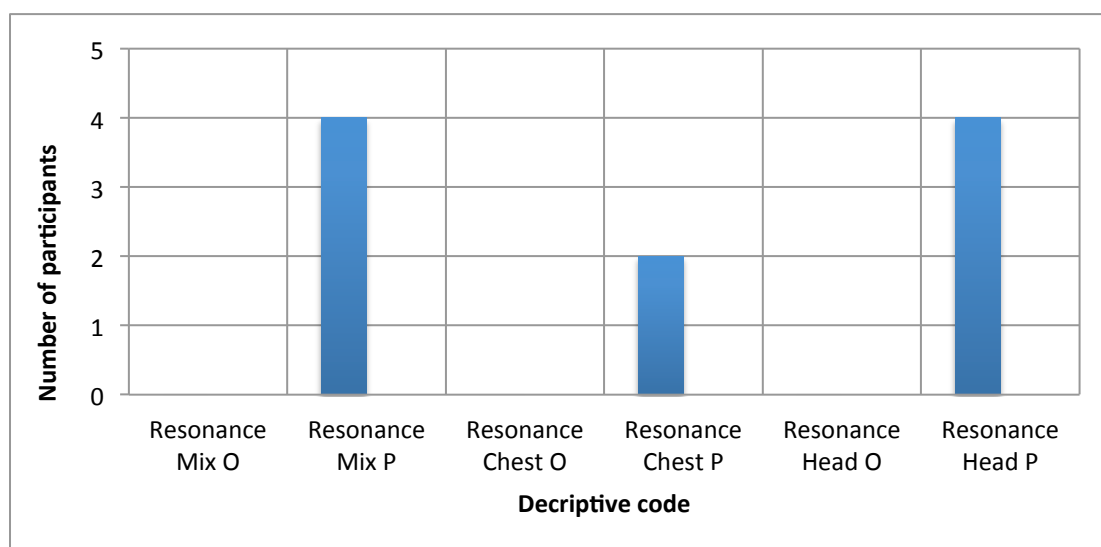
Figure 10. Resonance Vocal Production/Own Practice

Eleven participants (19%) referred to resonance (i.e. the sensation associated with sympathetic vibrations) in their answers (see figure 10). Five participants (8%) felt resonance when singing in their mix register. Two participants (3.5%) experienced resonance when singing in their chest mix register. Four participants (7%) felt resonance when singing in their head mix register. From these results it would seem that mix register elicited the most resonance, with chest mix register eliciting the least resonance. It could be inferred that chest mix register was the least comfortable, as it elicited the least amount of resonance as felt by the participants.

Sustainability
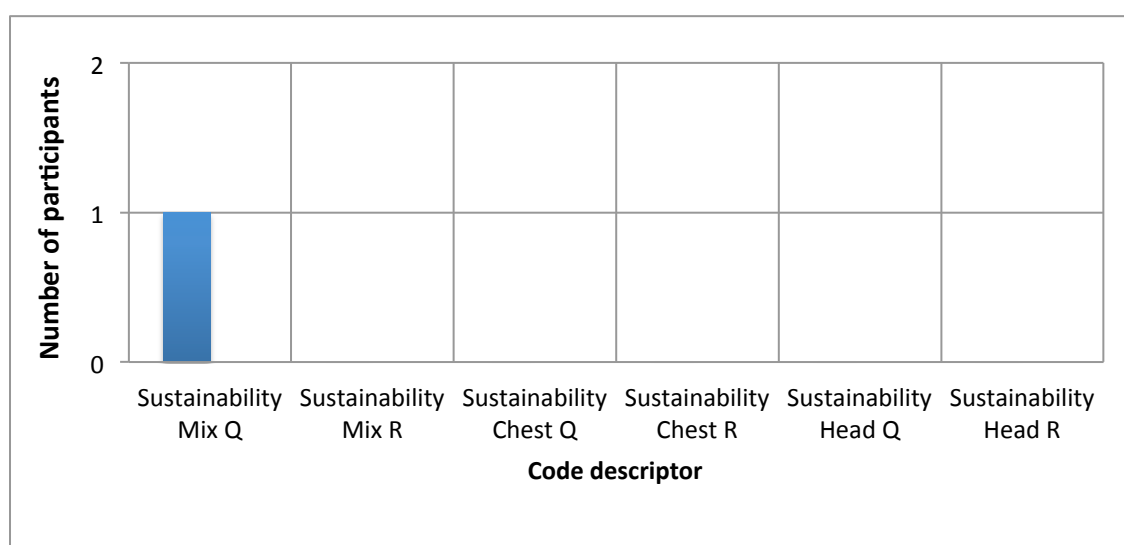
Figure 11. Own Practice: Sustainability

One participant commented that singing in the mix register "is better for sustaining a long performance" (see figure 11). No other participants commented on sustainability.

Understanding
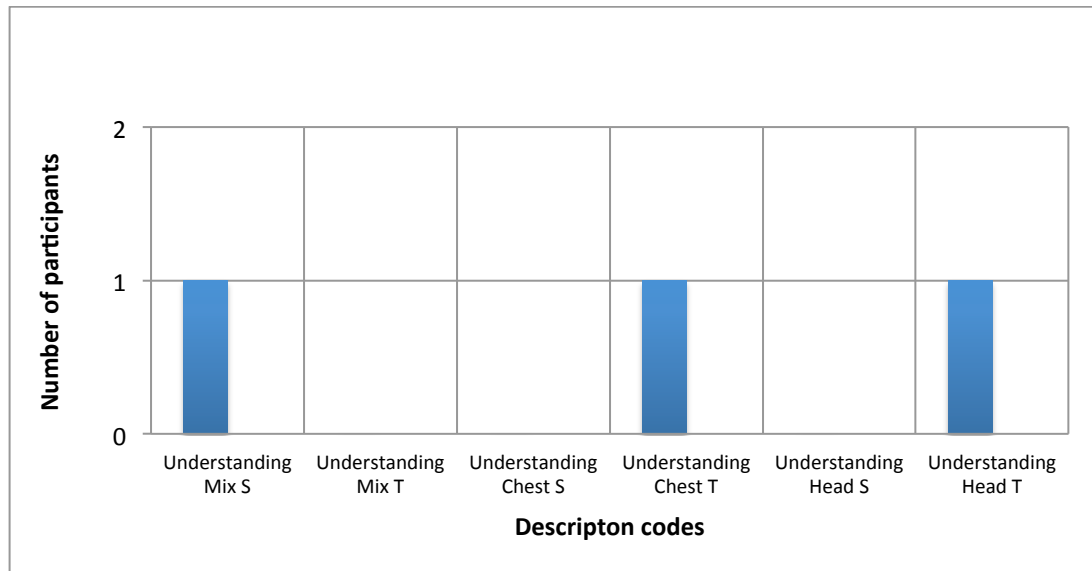
Figure 12. Own Practice: Understanding Vocal Production

Three participants (5%) addressed understanding, with two claiming clarity (one in regards to head and one in regards to chest) and one participant claiming confusion (see figure 12). "To this day I still feel a sense of confusion. The more I analyse it the less I understand it and yet I think I use it all the time". The participant was referring to mix register.

Intensity
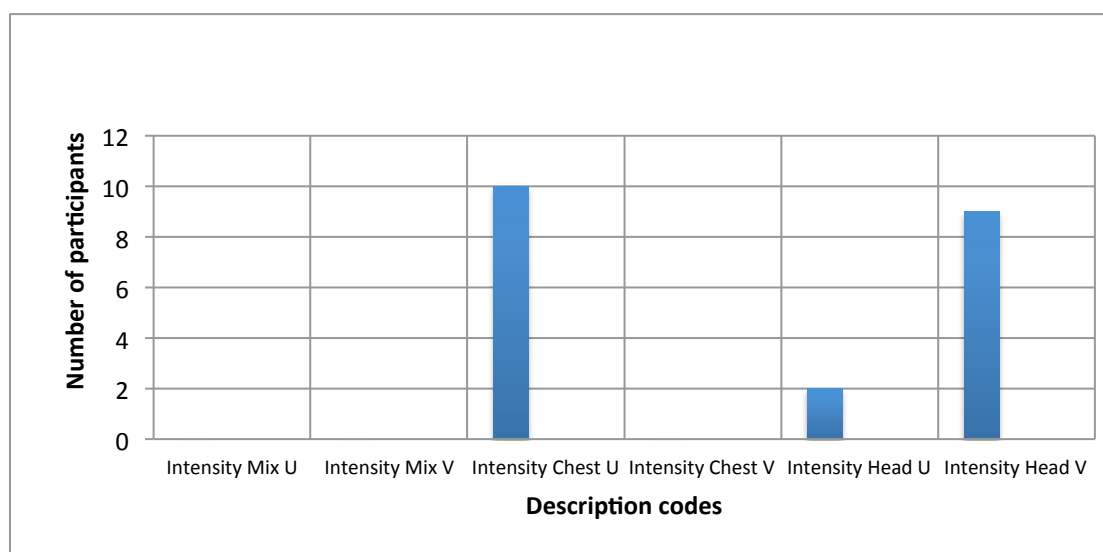
Figure 13. Own Practice: Intensity

None of the participants referred to intensity in their discussion of mix register (see figure 13). Of the 21 participants (36%) who commented on intensity, ten participants (17.5%) stated that they were able to achieve a lot more power in their chest mix register. Nine participants (16%) stated that they felt their head mix register was weak, whereas two participants (3.5%) stated that their head mix register was powerful.

Phonation
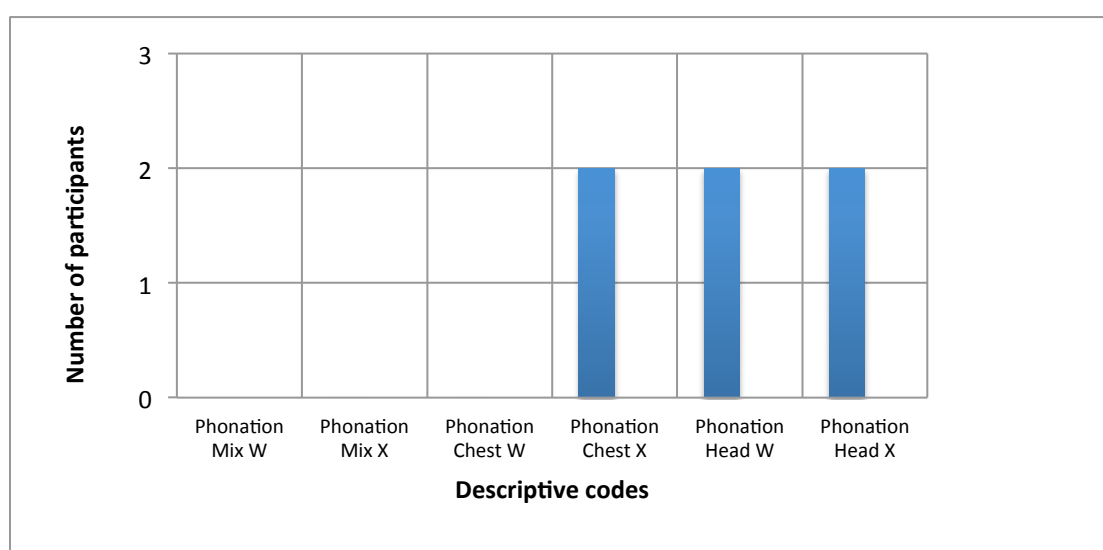
Figure 14. Own Practice: Phonation

No participants commented on phonation in regards to singing in mix register. Two participants (3.5%) stated that their voice was clear when singing in chest mix register (see figure 14). The wording of one participant showed a preference for the presence of breath in the voice: "I also think the chest voice is harder to sound airy than the head voice." Two participants (3.5%) stated that their voice sounded breathy when singing in head mix register, and two (3.5%) participants stated that their voice sounded airy when singing in head mix register.

Expression
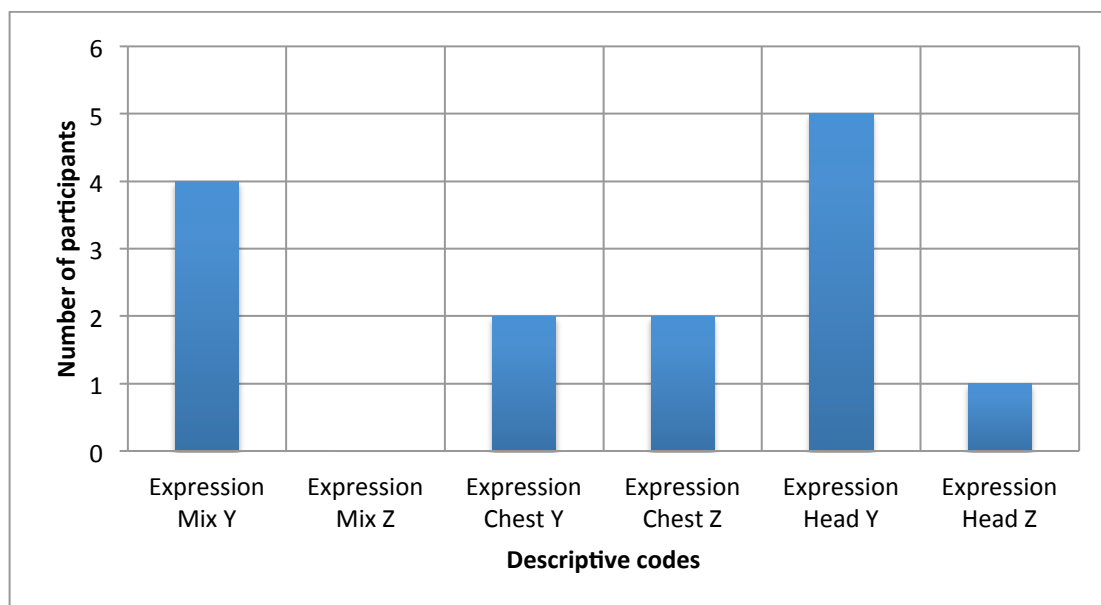
Figure 15. Own Practice: Expression

A total of fourteen participants discussed expression (see figure 15). Four participants (7%) claimed they found mix register more expressive. Two participants (3.5%) said that they found chest mix register expressive, and two participants (3.5%) commented that they found chest mix inexpressive. Five participants (8%) claimed that head mix register was expressive, and one participant stated that she found head mix inexpressive. It would seem that there was a majority of participants who found head mix more expressive. One wonders if this is due to the more regular use of chest mix in CCM. As a singer changes from the register of most use to sing in another register, there may be a sense of greater expressiveness.

Style
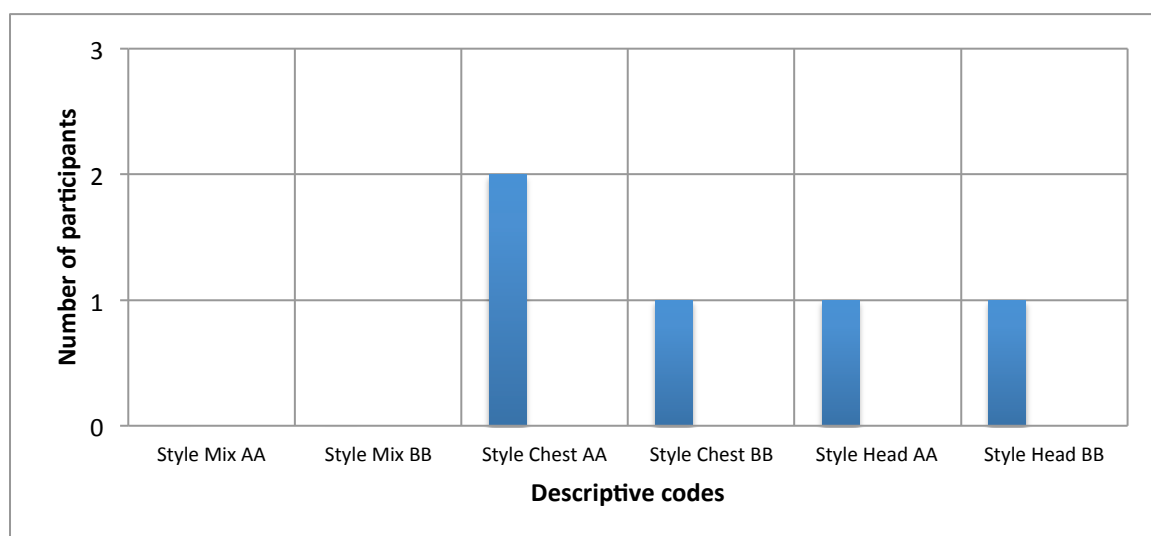
**Figure 16. Own Practice: Style**

Five participants mentioned style when discussing mix register (see figure 16). No participants commented on style when referring to mix register. Two participants (3.5%) remarked that they would employ chest mix register for stylistic choices. One participant commented that she did not use chest mix as a stylistic choice because she performed as a classical singer. One vocalist said that she didn't use head mix register due to stylistic conventions, and one singer reported she used head mix for *a cappella* singing. The researcher found it interesting that no participants commented on style when talking about mix register. This could be attributed to the idea that mix register is versatile and can be used across a broad range of styles, so that the participants did not associate mix register with a particular style.

Range
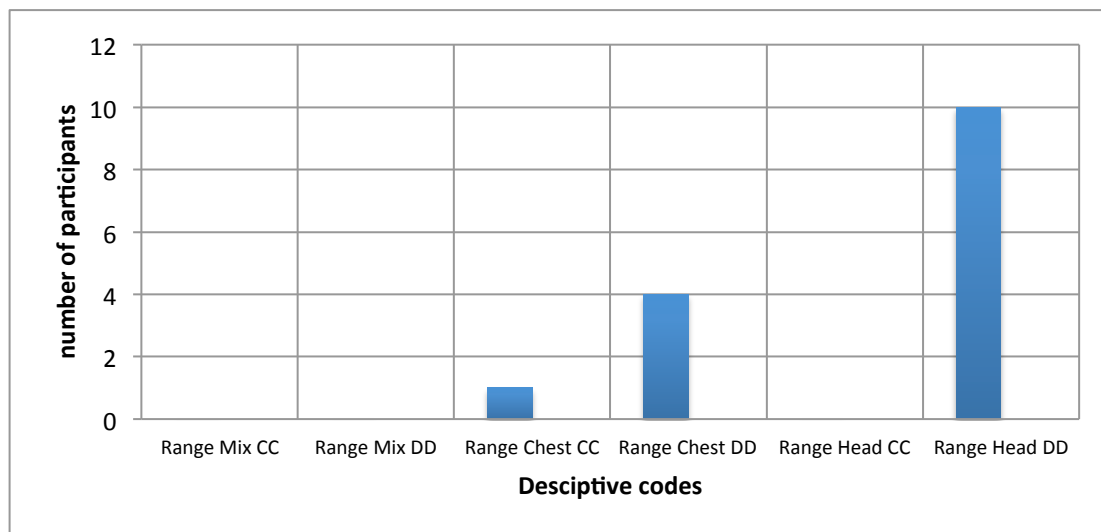
Figure 17. Own Practice: Range

Eight participants talked about range in reference to mix register (see figure 17). No participant mentioned range when discussing mix register. Four participants (7%) remarked that they used chest mix register for low notes. One participant remarked that she used her chest mix for high notes. Ten participants (17.5%) commented that they used head mix register for high notes. No participants commented on using head mix for notes that were low in their range. This idea is relevant for the overall investigation as it illustrates that chest mix is associated with low notes and head mix is associated with high notes. It illustrates that the participants still feel a dichotomy of registers and range and this is further confirmed by the fact that no participants commented on using their mix register for their upper or lower range.

Default
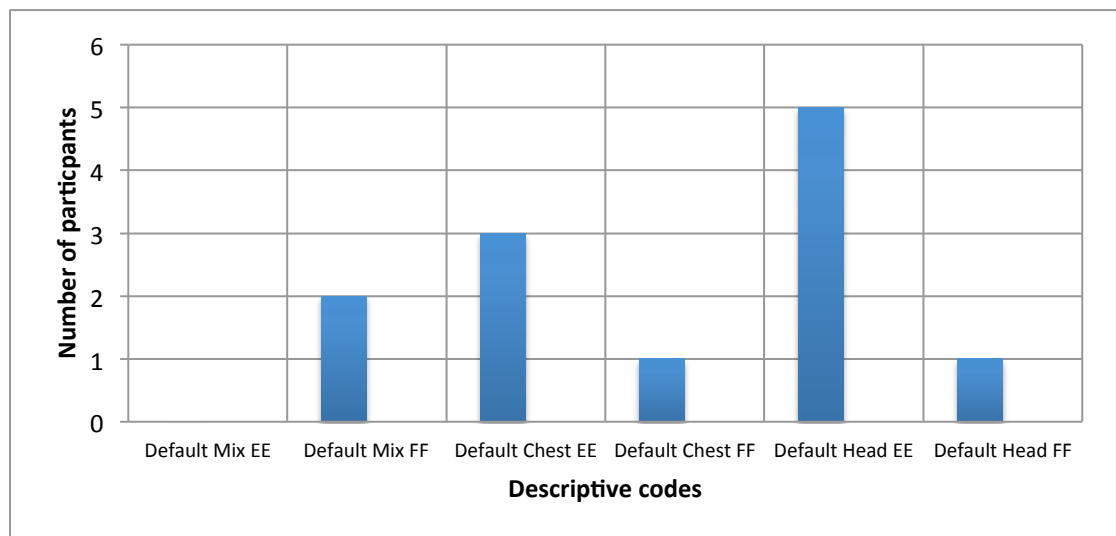
Figure 18. Own Practice: Default

Twelve participants talked about their considered default register in relation to singing in their mix (see figure 18). Three participants claimed that mix register was natural for them to use, whereas one participant said that it felt unnatural. Two participants stated that chest mix register did not occur naturally for them. One participant stated that chest mix occurred naturally. Five participants stated that they found head mix register natural for them to use, while one participant said that she found it unnatural, stating that she felt like an "opera singer" when using this register.

It is interesting to note that only one participant found that chest mix occurred naturally, as this seems to be the register that is used most often in CCM. It could be that participants chose not to state what they felt was an obvious occurrence for them, or it could mean that most participants do not feel that chest mix occurs naturally. If this is the case, then this is a consideration worthy of future investigation, since it has been established in the literature that CCM is closely linked with speech like singing, and that chest dominant production, or modal register, is most closely associated with speech.

Laryngeal tilt
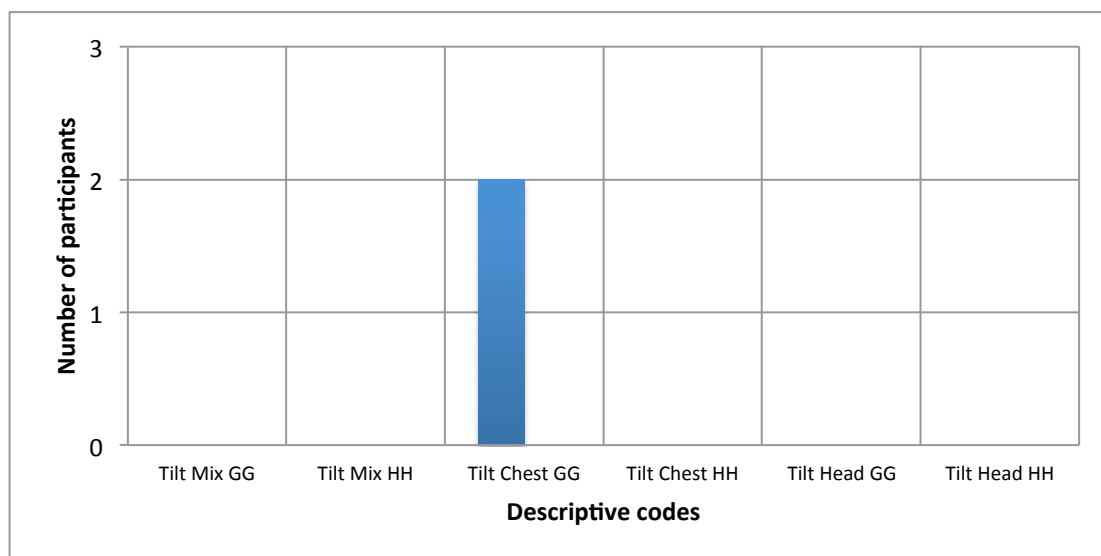
Figure 19. Own Practice: Laryngeal Tilt

Two participant talked about laryngeal tilt when they referred to their mix register (see figure 19 above). No participants made comments about a more tilted production when discussing mix register. Two participants (3.5%) talked about the connection between speech and chest register. No participants discussed the connection between speech and the upper register. This apparent lack of connection between speech and the head mix register could indicate a disconnection between chest mix and head mix for this cohort of participants.

Aesthetic Preferences
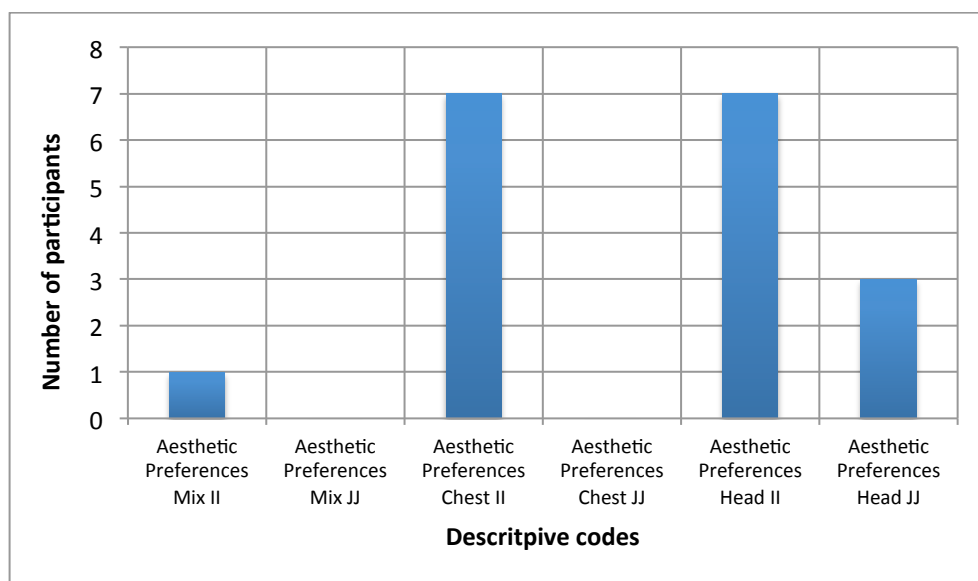
Figure 20. Own Practice: Aesthetic Preferences

A total of eighteen participants discussed their aesthetic preferences in regards to singing in mix (see figure 20). One participant referred to mix as her ideal choice: "ideally, [a] marriage of both of the two is my preference". It was assumed that here the participant was referring to head and chest mix.

Seven participants stated that they enjoyed singing in their chest mix and experiencing the resonance created by this. No participants expressed a dislike for singing in chest mix.

Seven participants said that they enjoyed the experience of singing in head mix in relation to the associated resonance. Three participants (5%) commented that they did not enjoy the experience of singing in head mix.

Judgement
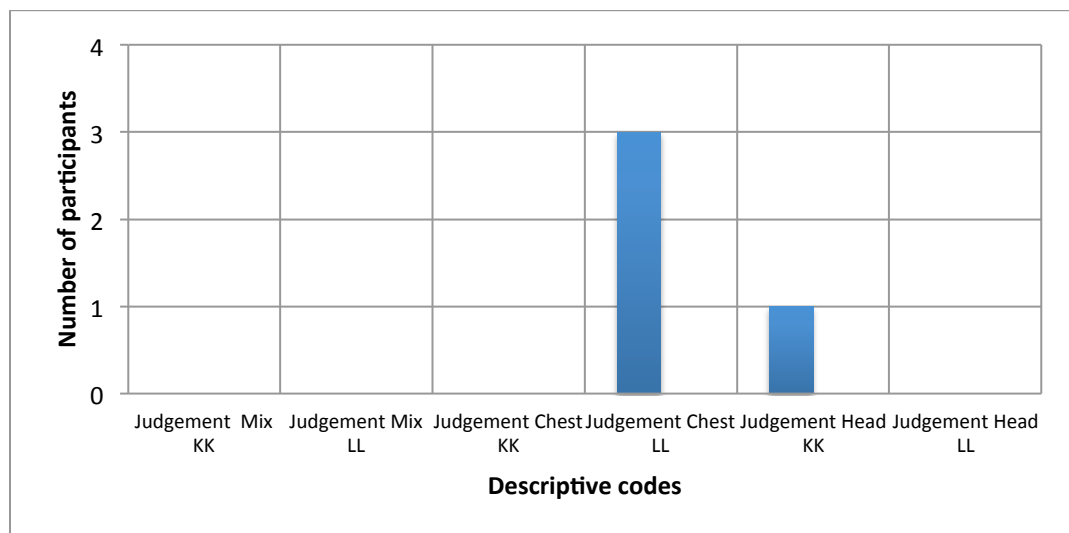
Figure 21. Own Practice: Judgement

Four participants made judgements when discussing mix register (see figure 21). No participants made judgements when talking about mix register. Three participants made judgement comments when they were discussing chest mix, such as "I was taught from an early age not to sing in my chest voice." One participant made a judgement comment in reference to singing in head mix.

Dynamic Range
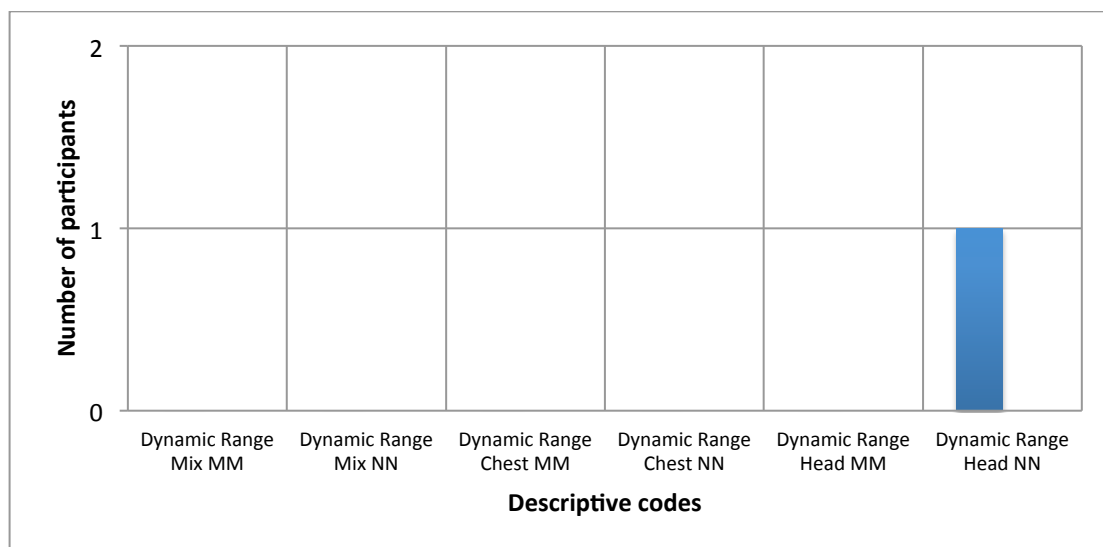
Figure 22. Own Practice: Dynamic Range

One participant mentioned dynamic range when talking about mix register (see figure 22 above). No participants mentioned dynamic range in reference to mix register or chest mix register. One participant stated that head mix is "easy for *piano* and high notes." The researcher wonders if this lack of discussion regarding dynamics could be attributed to the fact that the majority of the cohort were students. Would professional singers have discussed the use of register and dynamics to a greater extent?

Support
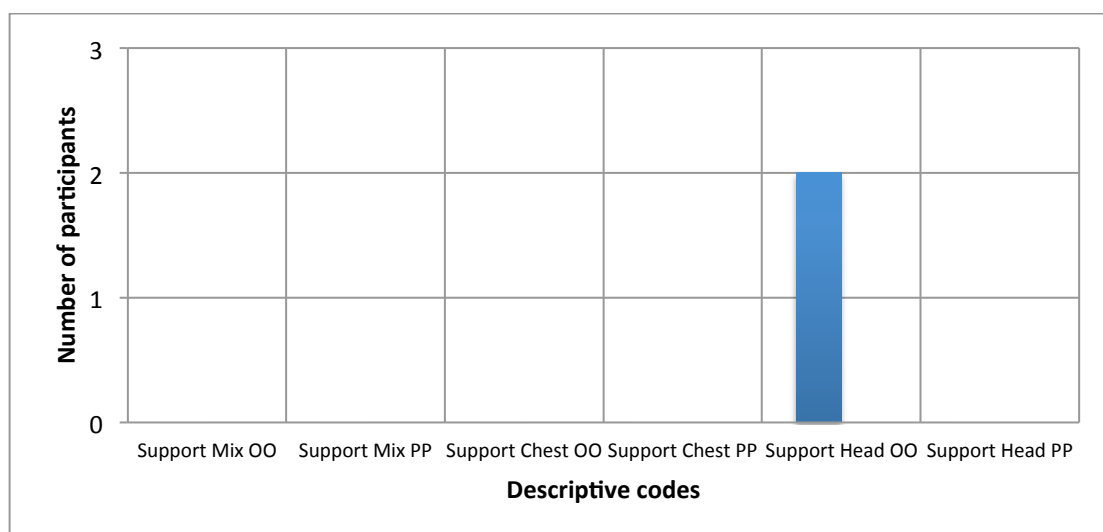
Figure 23. Own Practice: Support

Only two participants made a comment about support (see figure 23 above). Both of these were made in reference to singing in their head mix. Both participants also stated that they felt they needed more support when singing in this part of their voice. Could this indicate that there is a conception that head mix requires more support than chest mix or mix? This is an idea that the researcher has heard during informal conversation amongst acquaintances and it seems to be repeated here.

Study One: Analysis and Development of Listening Experiences

Degree of Difficulty (ease/lack of ease)
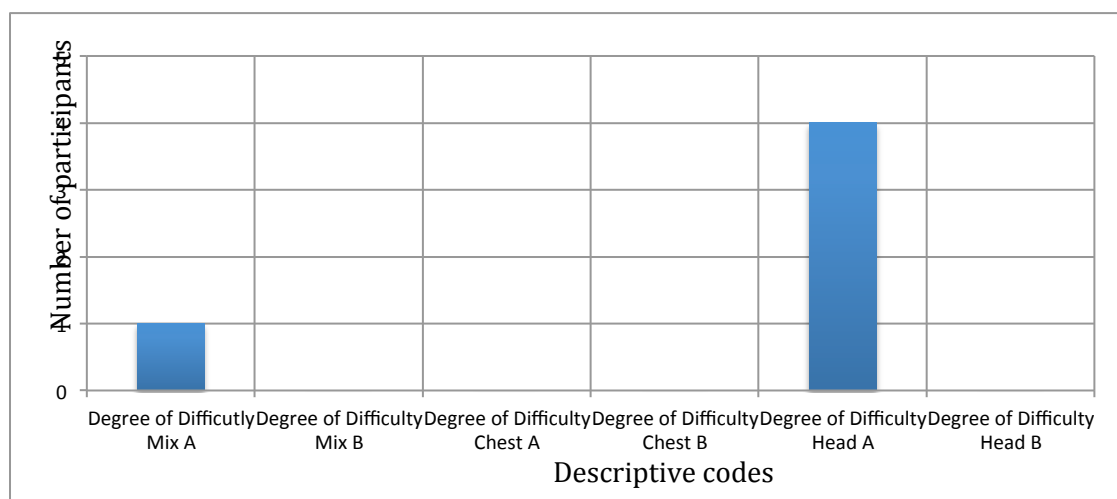
Figure 24. Others' Practice: Degree of Difficulty

Four participants (7%) commented on ease when discussing head mix register (see figure 24 above). The participants used comments such as "unforced, effortless and easy", for example: "[a] singer who excites me is one who can blend between the head and chest registers seamlessly and therefore the singing appears effortless."

No participants commented on degree of difficulty when discussing chest mix register.

Timbre (bright/dark)
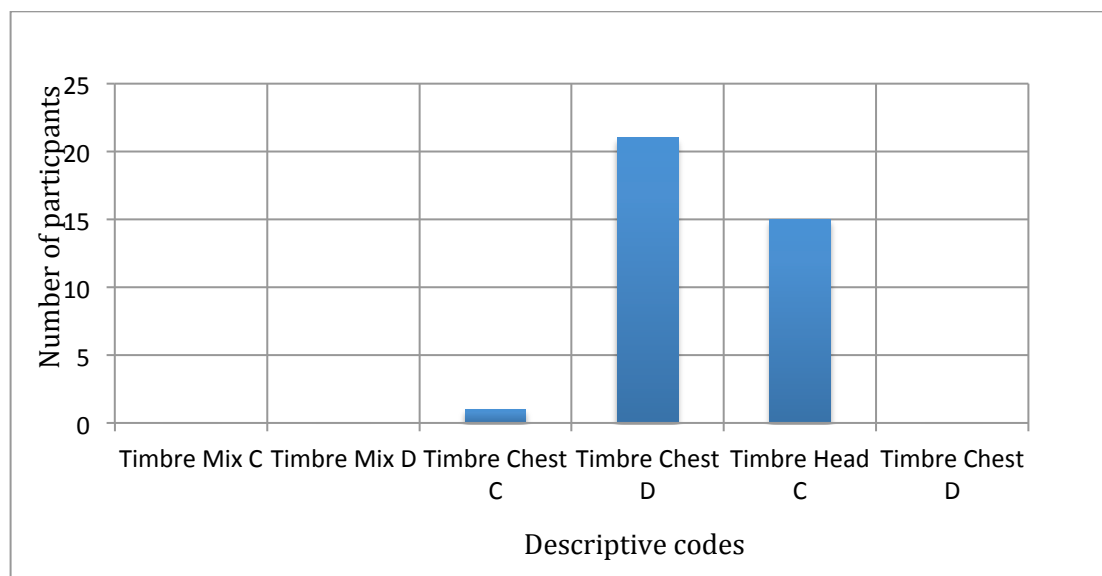
Figure 25. Others' Practice: Timbre

A total of forty participants mentioned timbre when they were talking about mix register (see figure 25 above). No participants commented on timbre when discussing mix register. Twenty-one participants (37%) described chest register as having a dark timbre and one participant described chest register as having a bright timbre. Fifteen participants (26%) defined head mix register as having a bright timbre. No participants stated that head mix had a dark timbre.

Register Transitions (ease of transition/difficulty of transition)
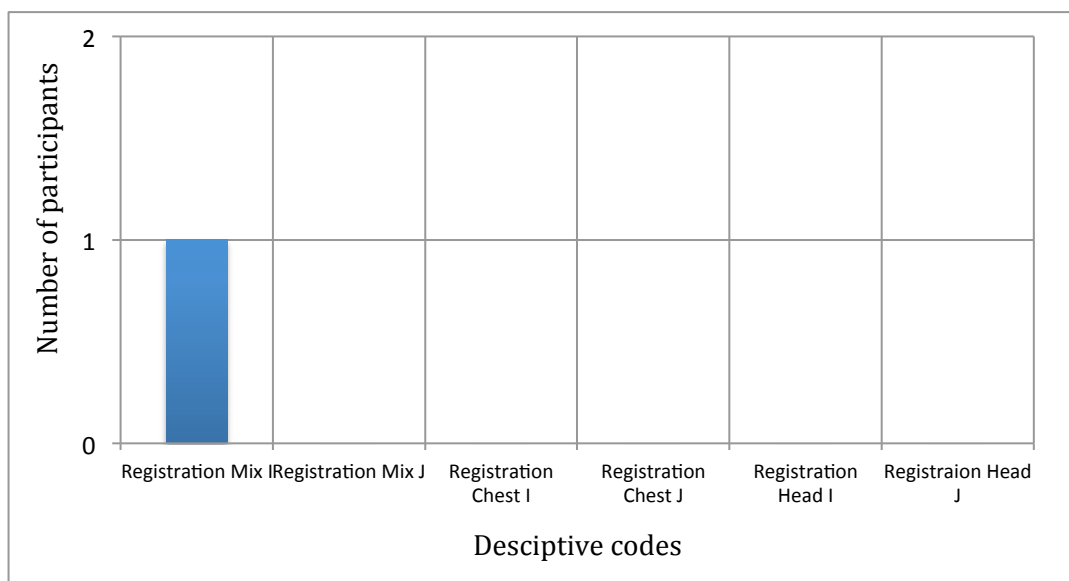
Figure 26. Others' Practice: Register Transitions

One participant commented on ease of transition in reference to listening: "[t]hese singers who can achieve that seamless cross over the register change are interesting and have greater depth to their work." No participants commented on difficulty of transition when discussing mix register. No participants commented on register transition in reference to either chest mix or head mix registration (see figure 26 above).

Skill (competent/incompetent)
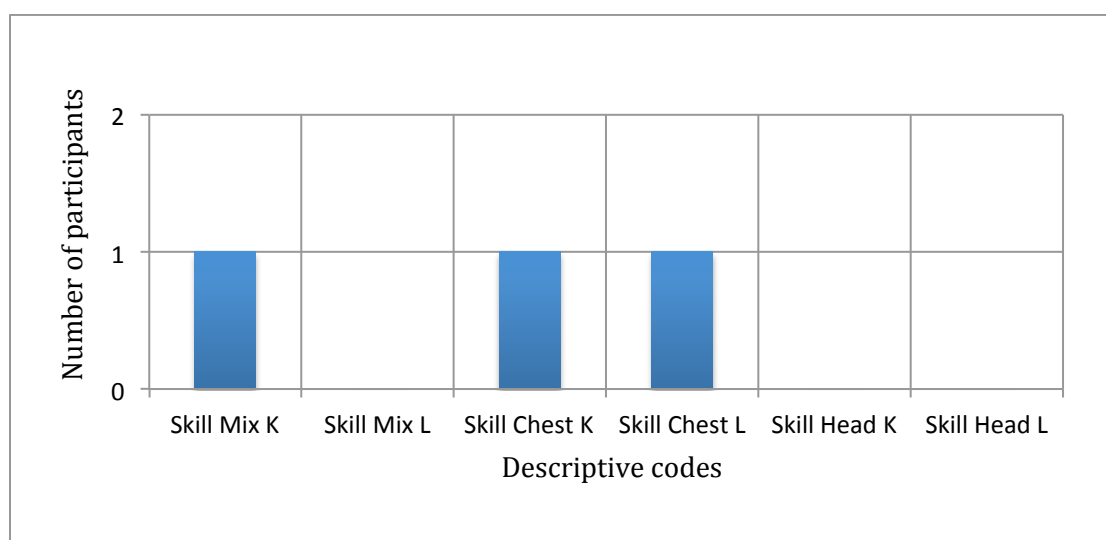
Figure 27. Others' Practice: Skill

Three participants discussed skill when talking about singing in mix register (see figure 27 above). One participant commented on competence when listening to singers singing in mix register. One participant made the following comment about competence when listening to singers perform in chest mix register: "I don't mind listening to it as long as it's used properly." Another participant commented on lack of skill in chest mix register: "Sometimes it's pushed, sharp intonation". No participants commented on competence or incompetence in head mix register.

Resonance (non-resonant/resonant)
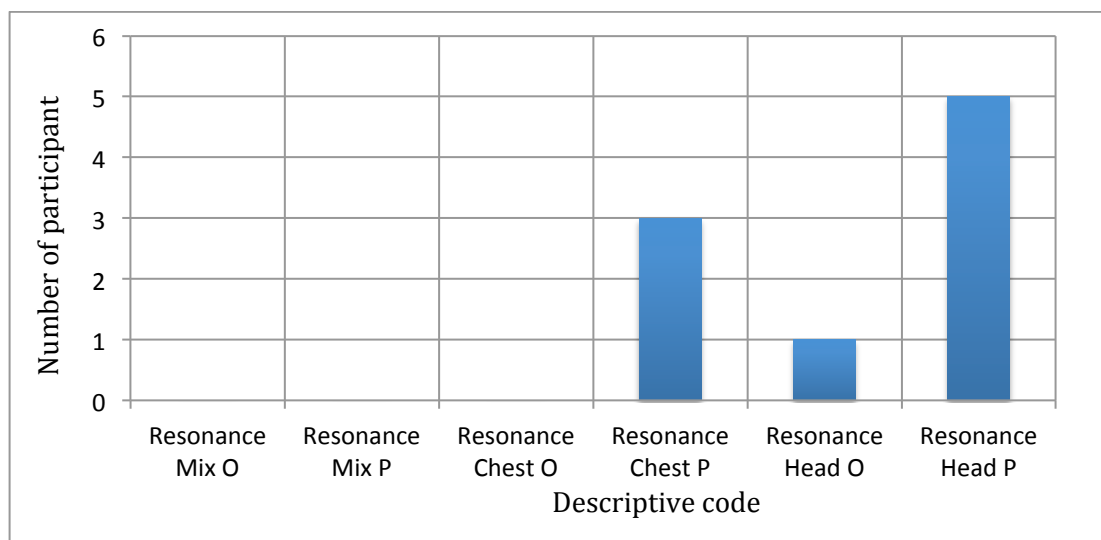
Figure 28. Others' Practice: Resonance

A total of nine participants mentioned resonance when they were talking about mix register (see figure 28 above). No participants commented on resonance when discussing mix register. Three participants (5%) remarked that chest mix register had resonance when they listened to a singer performing. Five participants (8%) remarked that they felt that head mix register was resonant when they were listening to someone singing.

Intensity (powerful/weak)
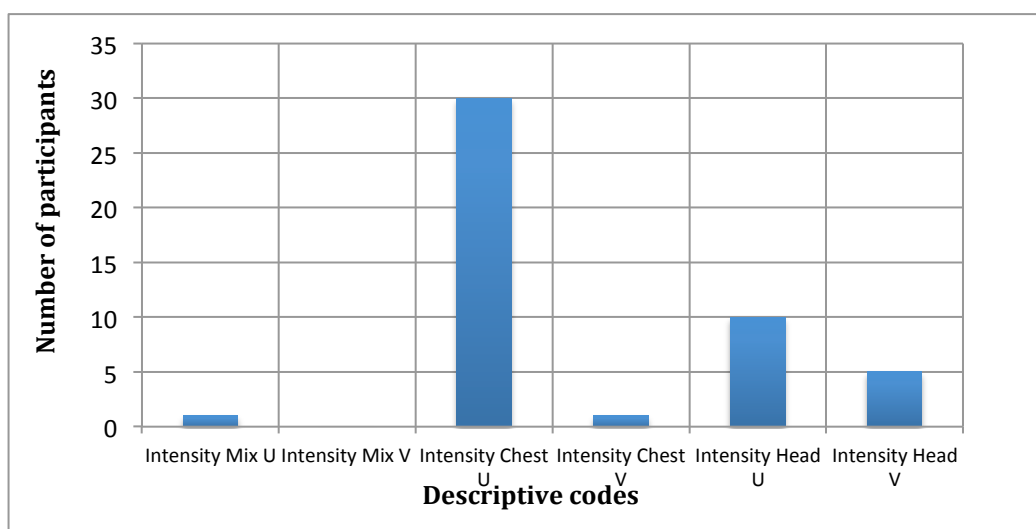
Figure 29. Others' Practice: Intensity

A total of forty-seven participants discussed intensity when referring to singing in mix register (see figure 29). One participant referred to mix register in terms of intensity, stating that she thought mix register sounded "powerful and moving". Thirty participants (53%) commented that chest mix register sounded powerful. One participant remarked that chest mix register was "softer", and this was coded as weak in intensity.

Ten participants (3.5%) observed a powerful intensity when listening to head mix register. Five participants (8%) remarked that they heard a weak intensity when listening to performances in head mix register.

Phonation (breathy/clear)
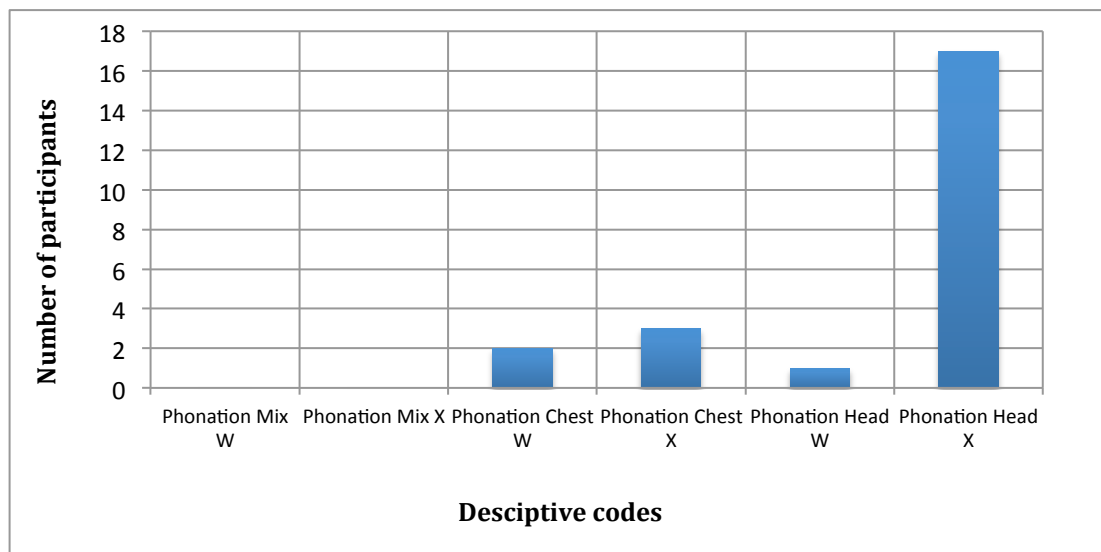
Figure 30. Others' Practice: Phonation

Twenty-two participants mentioned phonation when talking about singing in mix register (see figure 30 above). No participants made references relating to phonation when listening to mix register singing. Three participants (5%) commented on chest mix register being breathy. Two participants (3.5%) stated that they thought chest mix register was non-breathy. Seventeen participants (30%) commented on head mix register being clear. One participant stated that she regarded head mix register as breathy.

It is an interesting observation that head mix register has been stated as clear by a considerably large amount of participants. The researcher finds this point interesting due to her experience in the teaching studio where students working in head mix are more inclined to have a breathy onset than when singing in chest mix.

Expression (expressive/inexpressive)
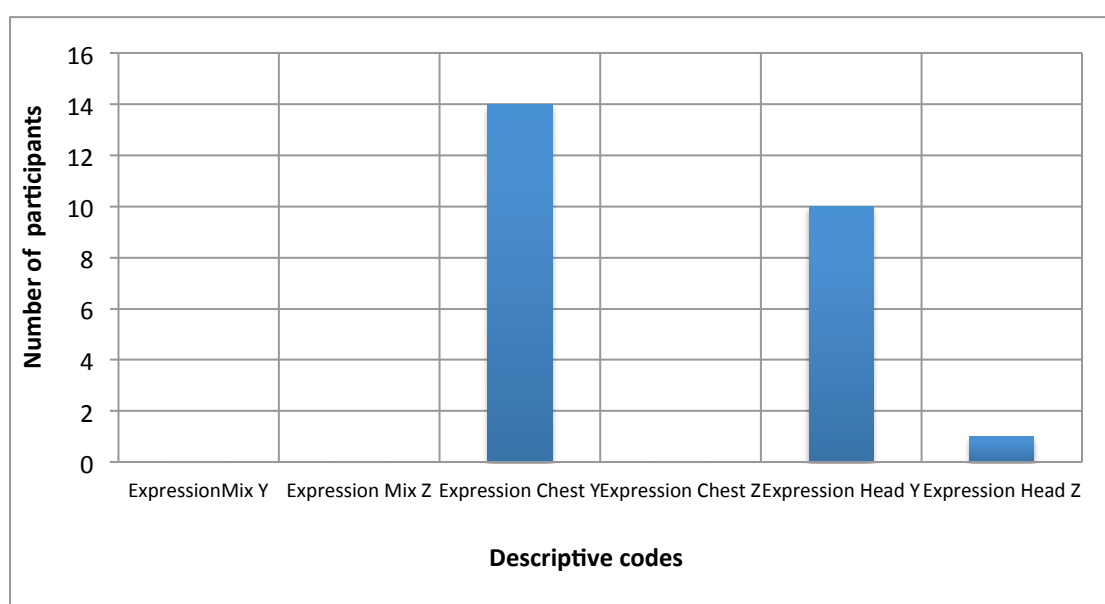
Figure 31. Others' Practice: Expression

A total of twenty-five participants discussed expression in relation to singing in mix register (see figure 31). No participants commented on mix register as being either expressive or inexpressive.

Fourteen participants (24.5%) commented on expression (including emotional expression) when discussing chest mix, with comments such as "it can be very powerful and moving", "I think that a vocalist can really touch people on an emotional level" and descriptors such as "passionate". The word "emotional" was used commonly amongst the participants in response to listening to singers perform in this register.

Ten participants (17.5%) commented on expression when discussing head mix. Words such as "moving", emotionally touching", "ethereal", "lilting" and "floating" were used to describe the participants' listening experiences. The word "emotional" and cognate words or synonyms were used less frequently in the participants' description of head mix. One participant commented on the lack of expression in head register, referring to it as, "closed", which was interpreted as inexpressive.

Style (stylistic/non-stylistic)
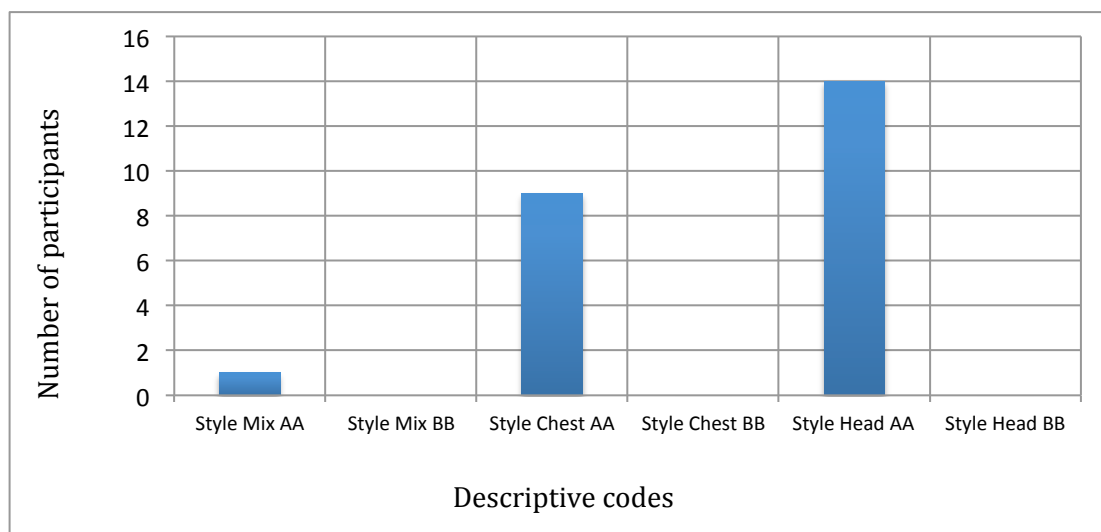
Figure 32. Others' Practice: Style

One participant regarded mix register as stylistic: "I am still moved and still interested in the musical theatre work that was prevalent in the 1980s and 1990s; it had these powerful, strong women who sang in their chest registers or mix and their roles were meaty and interesting."

Nine participants (16%) commented on chest mix as stylistic. An example of this is: "I don't like the female singer who powers out her chest voice to the point of shouting to convey some angst or emotion as is very typical of a lot of pop singers". Other participants mentioned styles such as "soul", "rock and pop", "bluesy" when talking about chest register.

Fourteen participants (24%) commented on head mix being stylistic. The participants commonly made comments such as "classical and operatic". No participants commented on head mix used in a non-stylistic fashion (see figure 32 above).

Range (high/low)
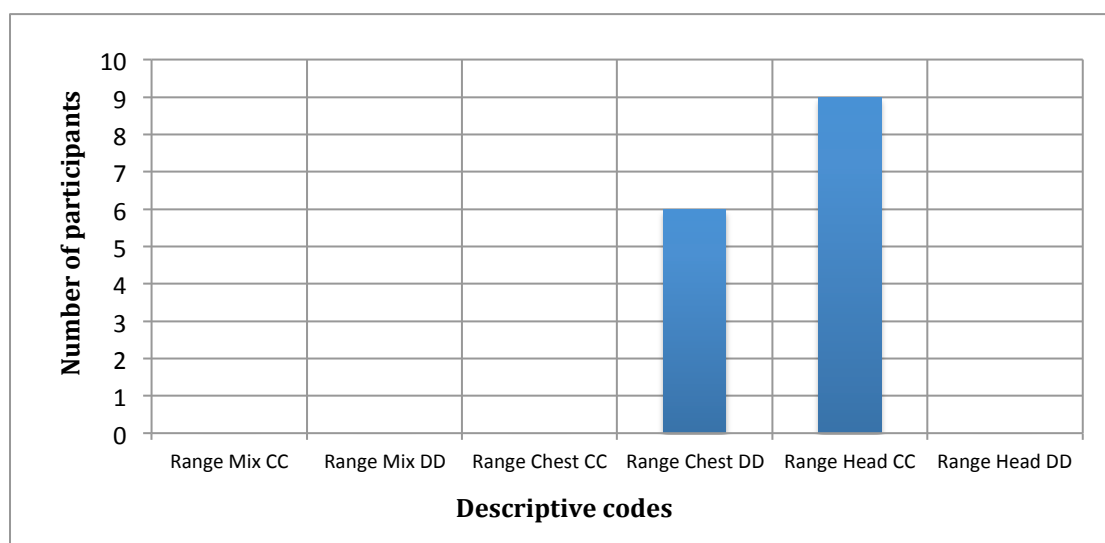
Figure 33. Others' Practice: Range

No participants spoke of range when discussing mix register. Six participants (10%) remarked on low range when discussing chest mix. No participants talked about high range when referring to chest mix. Nine participants (16%) commented on the range being high when singing in head mix. No participants commented on low range when discussing head mix (see figure 33 above).

The association between head mix and high range and between chest mix and low range continues the apparent correlation that singers make between registration and range. For example, even when listening to other singers perform; the participants were associating the head mix register with the higher notes and the chest mix with the lower notes. The researcher wonders if this is because of the types of singers to which the participants were listening.

Default (natural/unnatural)
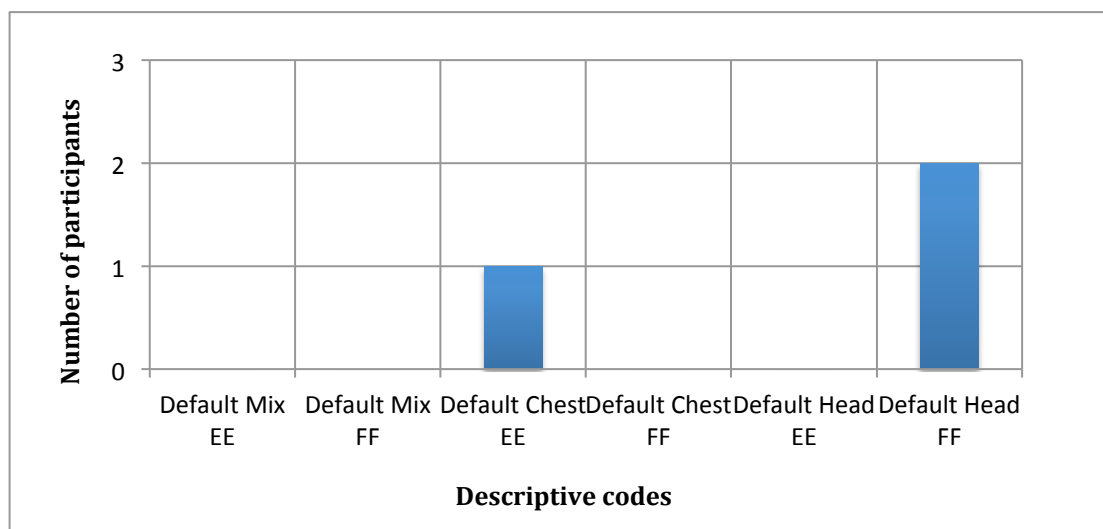
Figure 34. Other Practice: Default

No participants referred to mix register as a default register. One participant commented that chest mix sounded "natural" and this was interpreted as default. Two participants (3.5%) stated that head mix sounded "non-authentic" and "unnatural/tutored" in their listening (see figure 34 above). These descriptors were both interpreted as unnatural.

Laryngeal Tilt (untilted (speech)/tilted (singerly))
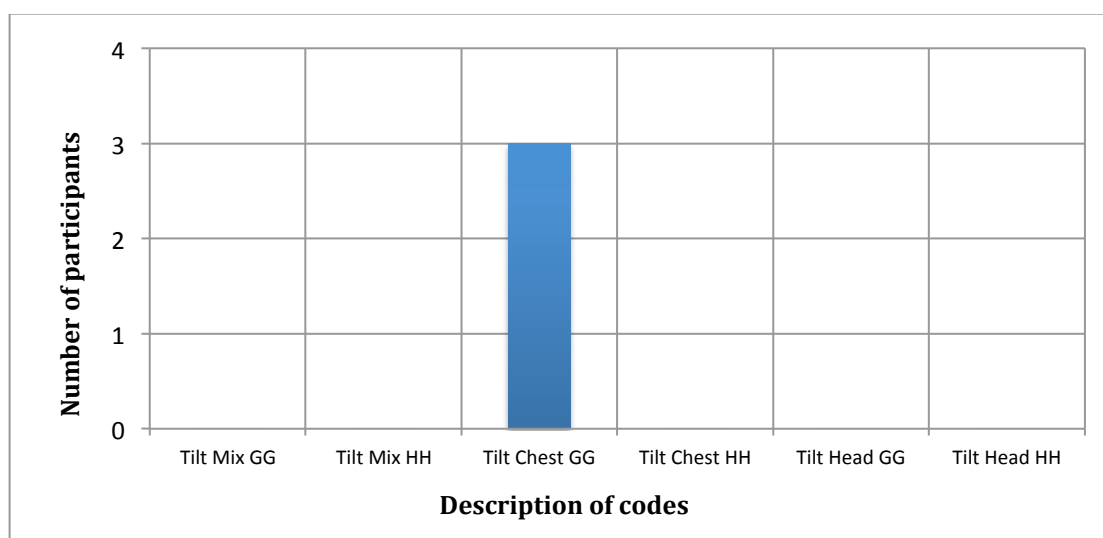
Figure 35. Others' Practice: Laryngeal Tilt

Three participants (5%) made comments relating to laryngeal tilt when discussing listening to chest mix (see figure 35 above). These participants used adjectives such as "conversational" and "talking". No participants made comments relating to laryngeal tilt when discussing listening to head mix or mix register.

Aesthetic Preferences (pleasing/non-pleasing)
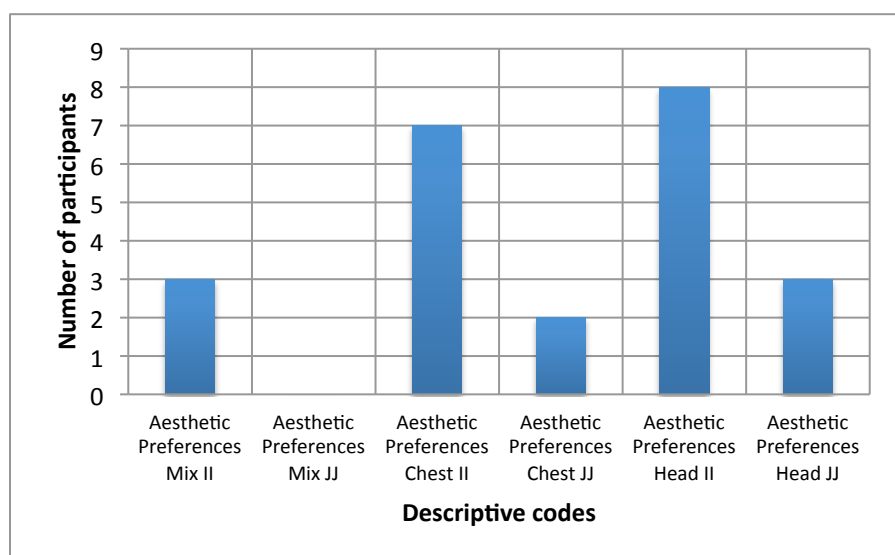
Figure 36. Others' Practice: Aesthetic Preferences

Three participants (5%) commented on mix register as pleasing to listen to. Seven participants (12%) remarked that chest mix was pleasing to listen to, whereas two participants stated that chest mix was not pleasing to listen to. Eight participants (14%) commented that head mix was pleasing to listen to. Three participants remarked that they did not enjoy listening to a performance in head mix (see figure 36 above).

Judgement (healthy/non-healthy)
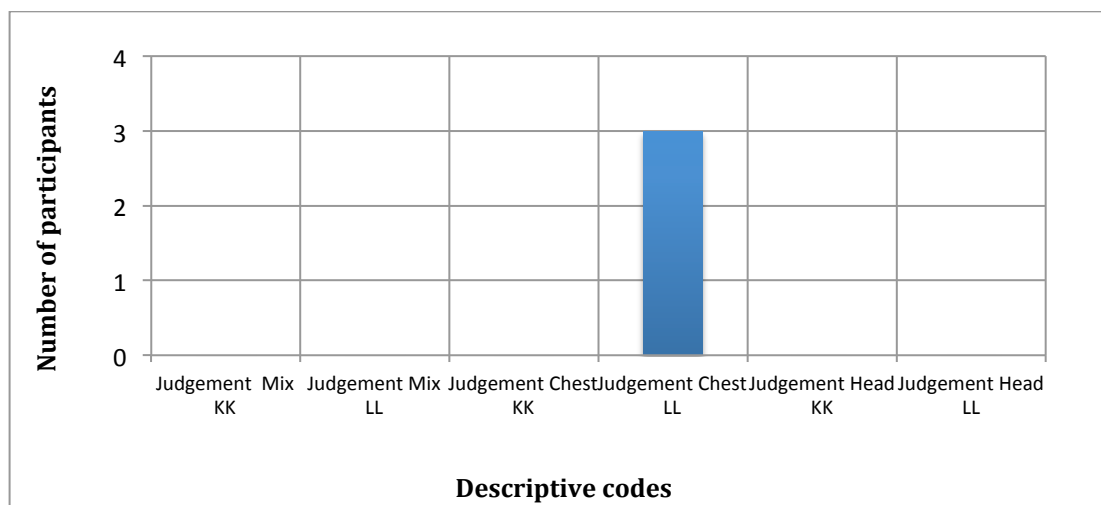
Figure 37. Others' Practice: Judgement

With regard to judgments of chest mix register, two participants commented: "[h]earing a child 'belt' out their song in their chest voice gives me the shivers. I don't feel that an immature voice has the capacity to successfully manage their chest voice without permanent damage." Two other participants (3.5%) commented that chest mix register sounded unhealthy. No participants passed judgment comments when discussing listening to head mix or mix register (see figure 37 above).

Support (more required/less required)
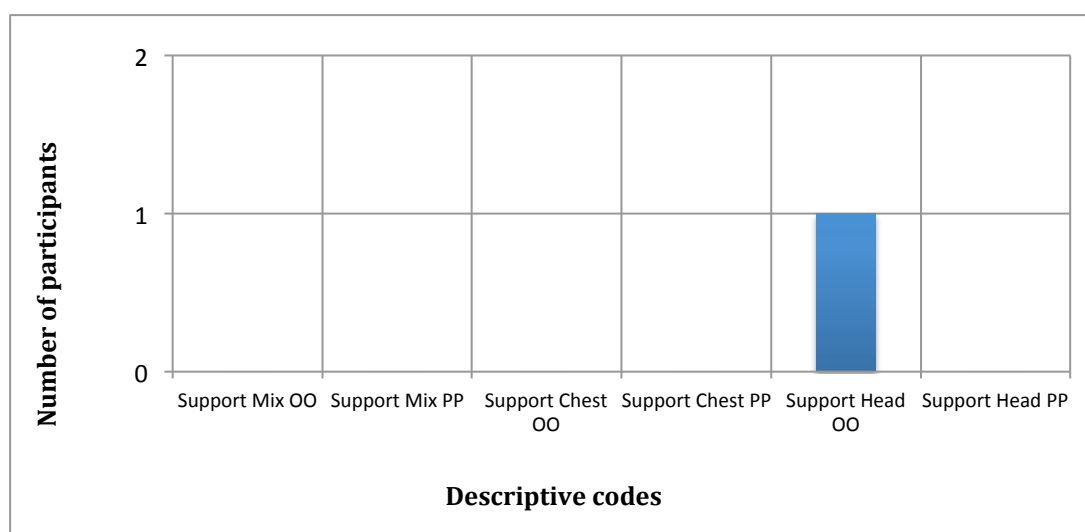
Figure 38. Others' Practice: Support

No participants commented on support when discussing mix or chest mix register. One participant commented on support when discussing head mix, stating that this register sounded "well supported" (see figure 38 above).

Range – Small (narrow)/ Large (broad)

No participants commented on range in discussions of mix, chest mix or head mix register.

Tessitura (comfort/discomfort)

No participants commented on tessitura in discussions of mix, chest mix or head mix register.

Significance (important/unimportant)

No participants commented on significance when discussing mix, chest mix or head mix register.

Sustainability (sustainable/unsustainable)

No participants commented on sustainability when discussing mix, chest mix or head mix register.

Understanding (confusion/clarity)

No participants commented on understanding when discussing mix, chest mix or head mix register.

Dynamic Range – Small (narrow)/large (broad)

No participants commented on dynamic range when discussing mix, chest mix or head mix register.

The amount of data elicited from the analysis of "others' practice" in Study One was less than for the analysis of "own practice" in Study One. However, the main patterns remained consistent. Chest mix registration was described as having a dark timbre, having a strong intensity, and being performed in pop, rock and soul style. Head mix registration was described as having a bright timbre and being of classical and operatic style. Interestingly, head mix registration was more often described as having a clear phonation than was chest mix register, even though just over half the cohort of participants described chest mix as having a strong intensity. These patterns and observations will be further explored in the final chapter.

The final part of the analysis from Study One takes into account the listening influences of the participants and this is laid out below.

Study One: Listening influences

Secondary Students

	Chest	Chest/ mix	Mix	Mix/ Head	Head	Head/ Chest	No preference
■ Chest/mix influences	4		2				
■ Chest influences	5		7	1	3	1	2
■ Mix/Head influences							
■ Mix influences							
■ Chest/Head influences			1		2		
■ Head influences						1	
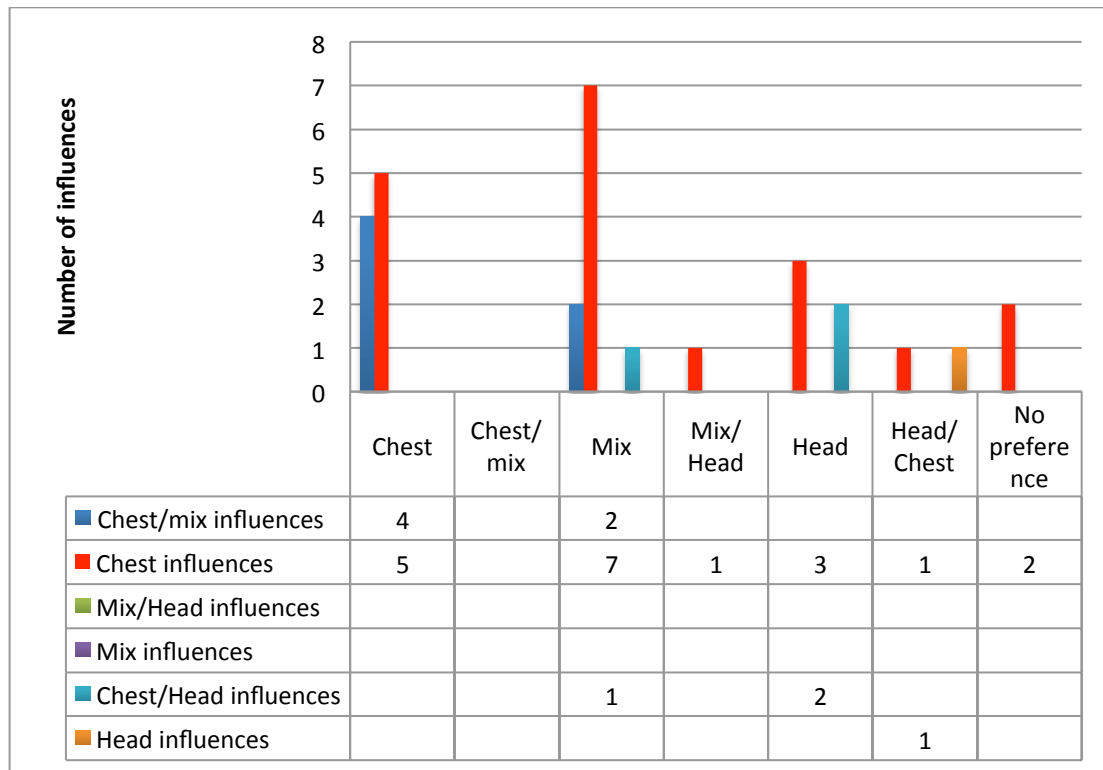
Figure 39. Secondary Students' Listening Preferences as Broken Down by Register Dominance

The researcher analysed the artists that the participants listed in their questionnaire. Acting as expert listener, the researcher categorized the artists as using predominantly chest mix, a balance of chest and head, or head mix. The answers were then graphed according to figure 39 above.

Where there is an allocation of chest/mix influences it denotes that the participant listed singers whom the researcher deemed as singing in predominantly chest mix register, as well as singers whom the researcher deemed as singing in a balanced mix register.

Where there is an allocation of mix/head influences, it denotes that the participant listed singers whom the researcher deemed as singing predominantly in chest mix register, and singers whom the researcher deemed as singing predominantly in head mix register.

Where there are chest/head influences, it denotes that the participant listed singers whom the researcher deemed as singing predominantly in chest register, and singers whom the researcher deemed as singing predominantly in head register.

The Figure above breaks down the listening experiences of the participants according to dominant registration as determined by the researcher. Below is a further breakdown of the listening experiences of the secondary students as a whole cohort.

Five out of 26 students (19%) preferred singing in chest and only named vocal influences that sang predominantly in chest mix register.

Four out of 26 students (15%) preferred to sing in chest register and named vocal influences who sang in chest and mix register.

Two singers (7%) stated that they preferred to sing in mix register and named singers who sang in chest and mix register.

Seven out of 26 students (27%) preferred to sing in mix and named vocal influences that sang predominantly in chest mix register.

Three out of 26 students (11.5%) stated that they preferred to sing in head mix register but only listed vocal influences who sang in chest mix register.

One participant stated that she preferred to sing in mix register and named vocal influences who performed in chest, with one vocal influence a classical singer.

One participant stated that she preferred to sing in mix/head register and named vocal influences who sang in chest mix register.

Two singers (7%) stated that they preferred to sing in head mix register and named vocal influences who sang in both chest and head register.

Two participants (7%) did not state a preference, and named vocal influences who sang predominantly in chest mix.

One participant stated a preference for singing in both head and chest. One of her named influences is a well-known legit singer, and one singer who influenced her is a well-known belt singer.

Seventeen out of 26 students (65%) named vocal influences that sang predominantly in chest register.

Ten out of 26 students (38.5%) listened to singers who used more than one register.

These results show that proportionately more students listened to singers who sang in chest and less than half of this population listened to singers who sang in more than one register. It can be inferred from these results that this population had a relatively narrow listening practice of listening to singers in chest mix registration. This could be attributed to the participants listening to genres such as pop and rock in which the singers mostly perform in a chest mix registration.

Tertiary Students

	Chest	Chest/mix	Mix	Mix/Head	Head	No preference
■ Chest/mix influences	4		1		1	
■ Chest influences			3			
■ Mix influences	1					
■ Chest/Head influences						
■ Chest/Mix/Head influences	1					

Figure 40. Tertiary Students' Listening Preferences

Figure 40 above breaks down the listening experiences of the participants according to dominant registration as determined by the researcher. Below is a further breakdown of the listening experiences of the tertiary students combined as a whole cohort.

Four out of 11 students (36%) preferred to sing in chest register and named vocal influences, who sang in chest mix and mix registers.

One out of 11 students preferred to sing in chest register and named vocal influences who sang predominantly in mix register.

Four out of 11 students (27%) preferred to sing in chest mix and named vocal influences who sang in chest mix, mix and head mix registers.

Three out of 11 students (27%) preferred to sing in mix, yet named vocal influences who predominantly sang in chest mix register.

One out of 11 students preferred to sing in head mix register and named vocal influences who sang in chest mix and mix register.

Of this population, the results show that proportionately more students listened to singers who sang in chest mix and mix registration. This is can be interpreted as a broadening of listening experiences from that of the secondary students who only listened to singers who sang in chest mix registration. However, there were no students who listened to singers who performed across all registers, so it could be concluded that there remains a limit to this cohort's listening experiences.

Mature Students and Professional Singers

Number of influences	Chest	Chest/mix	Mix	Head	No preference
Chest/mix influences	3		3	1	
Chest influences	3	1		1	
Mix influences			1		
Chest/Head influences				1	1
Chest/Mix/Head influences			2	1	
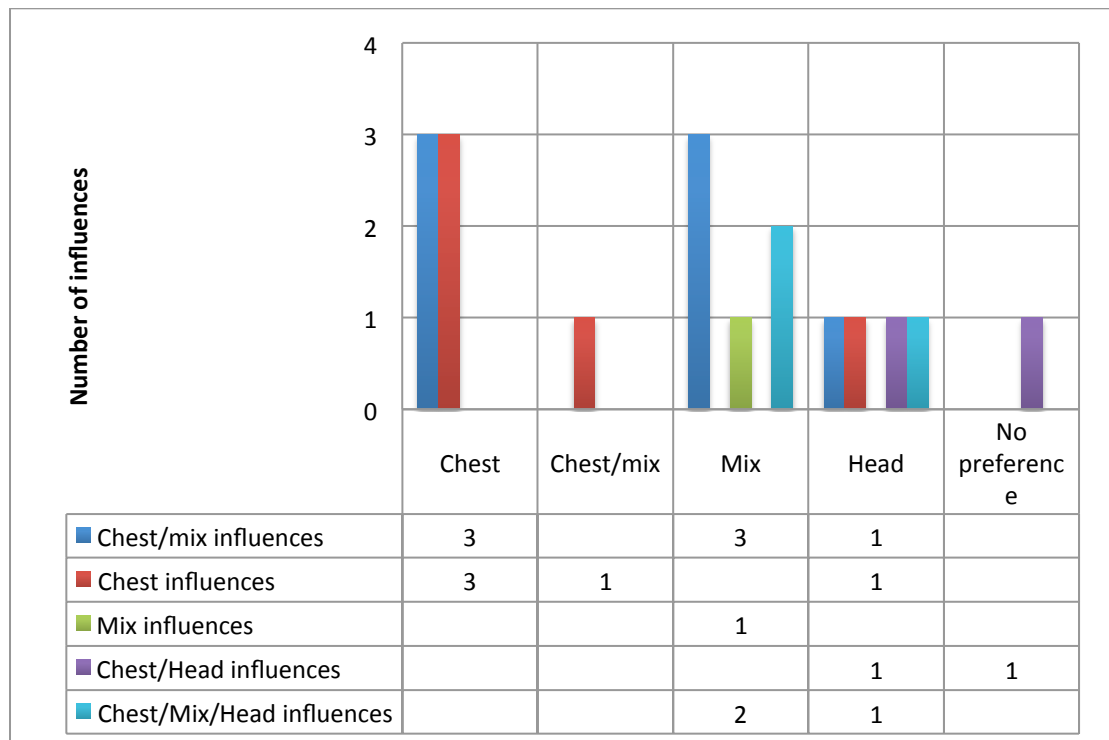
Figure 41. Mature Students' and Professional Singers' Listening Preferences
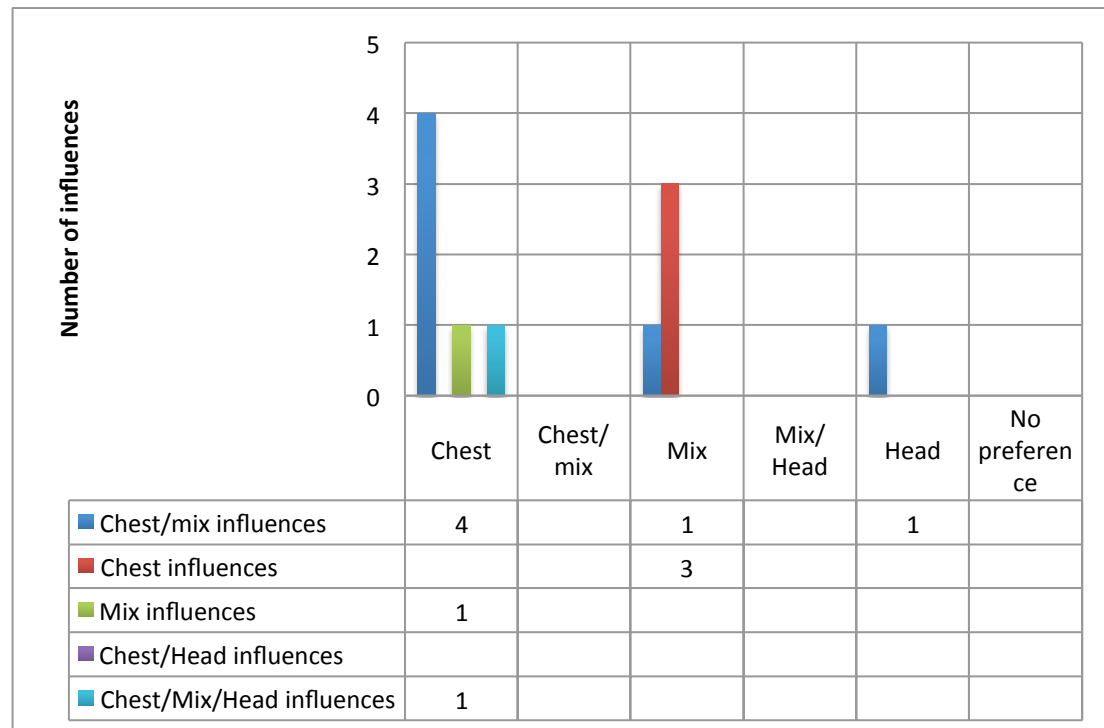
Figure 41 above breaks down the listening experiences of the participants according to dominant registration as determined by the researcher. Below is a further breakdown of the listening experience of the mature students and performers as a whole cohort.

Three out of 20 singers (15%) preferred to sing in chest mix register and named vocal influences who sing predominantly in chest mix.

Three out of 20 singers (15%) preferred to sing in chest mix register and named vocal influences who sing in chest mix and mix registers.

One out of 20 preferred to sing in chest mix register and named vocal influences who sing in chest mix.

One out of 20 preferred to sing in mix register and named vocal influences who sing in mix register.

Three out of 20 singers (15%) preferred to sing in mix register and named vocal influences who sing in chest mix and mix registers.

One out of 20 preferred to sing in mix register and named vocal influences who sing in chest mix and head mix registers.

Two out of 20 (10%) preferred to sing in mix register and named vocal influences who sing in chest mix, mix and head mix registers.

One out of 20 preferred to sing in head mix register and named vocal influences who sing in chest mix and mix registers.

One out of 20 preferred to sing in head mix register and did not name any vocal influences.

One out of 20 preferred to sing in head mix register and named vocal influences who sing in chest mix, mix and head mix registers.

One out of 20 preferred to sing in head register and named vocal influences who sing in chest mix and head mix registers.

One out of 20 preferred to sing in all registers and named vocal influences who sing in chest mix and mix registers.

One out of 20 preferred to sing in head mix register and named vocal influences who sing predominantly in chest mix register.

Of this population, there were three participants who performed in all three registers. This factor lends this cohort the broadest listening range. It could be interpreted from this that a participant's listening experiences/practices became broader with age and experience.

To summarise, the listening influences data: secondary students predominantly listened to singers who performed in chest mix register. No secondary students stated that they listened to singers from all three registers, and most secondary students listened to singers of only one register. From this information, it can be determined that secondary singers had a narrow listening experience.

Tertiary students predominantly listened to singers who performed in chest mix and mix registers. Only one tertiary student stated that she listened to singers who performed in all three registers. Four participants stated that they listened to singers who performed in only one register. However, this data demonstrates that tertiary students had a broader listening experience than the secondary students.

Mature students and professional singers predominantly listened to singers who performed in chest mix and mix registers. Four participants stated that they listened to singers who only sang in one register. Three of the participants listened to singers who performed in all three registers. From the data it can be inferred that mature students and professional singers had the broadest listening experiences out of the three.

Study Two: Three Professional Singers

Analysis and development of own practice

As mentioned above for study one, the results from the coding in NVivo were summarised in an Excel chart. The number of times that the participant discussed a node was listed along the vertical axis and the node titles were listed along the horizontal axis. Any node that was discussed significantly could be clearly seen. It was interesting to note that the professional singers' extensive listening experiences were not restricted to singing in their own preferred register.

A graph of the results for the three professional singers appears below:

Subject A
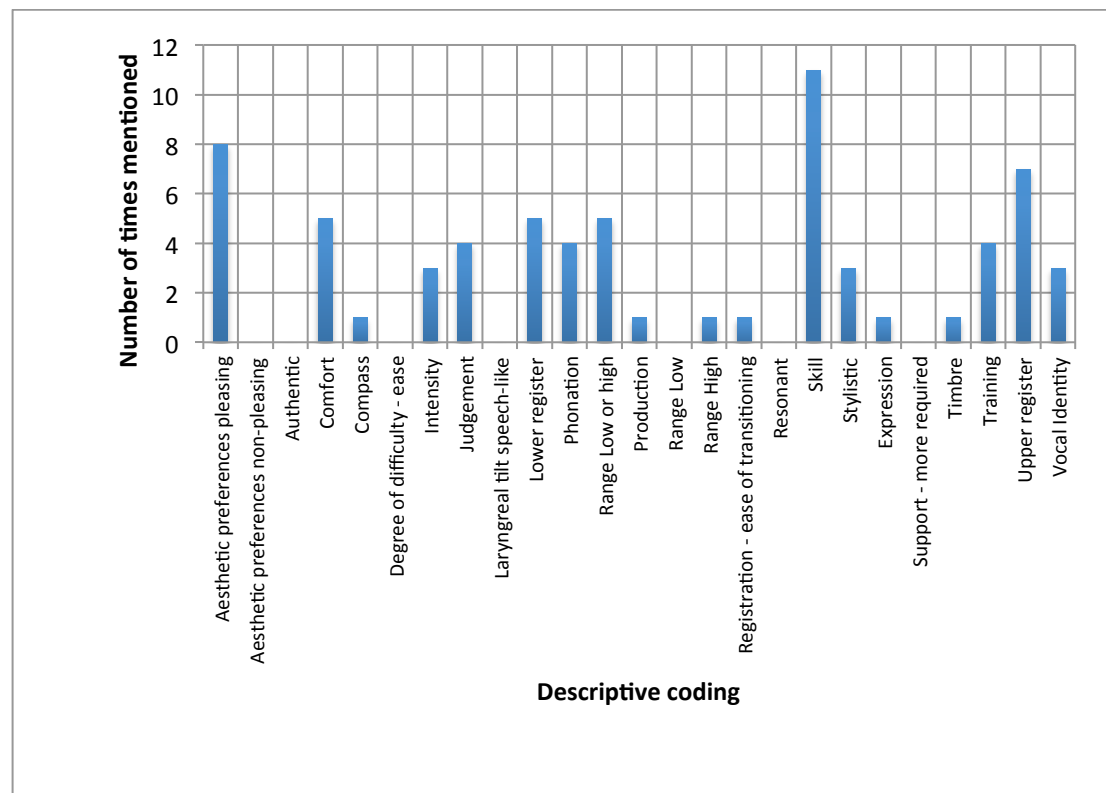
Figure 42. Subject A Own Practice

Please refer to figure 42 above for a tabled result of her interviews. One subtopic of the interview with Subject A was her reference to skill. Some examples of her reference to skill follow:

"I feel like I've achieved something when I sing in my head voice and I feel like I have control and I feel like I've, um, I know things and I have polish and skill when I sing in my head voice."

"I feel like I have authority and I have flexibility and I can sing in tune, which is always nice. Um, I guess I also feel like I belong to a, you know, an invisible club of people who can actually sing."

The subtopic in the interview was Subject A's reference to aesthetic preference. An example of aesthetic preference in the discussion appears below:

"Even when it's a mix…if I listen back to a recording of myself and I've…I just sound much nicer when I sing in that register I think."

Subject A discussed upper and lower registers and compass, which could be clustered together as overall range.

Subject A described her preferred register as head voice. Her favoured register to listen to was also head voice.

Subject B
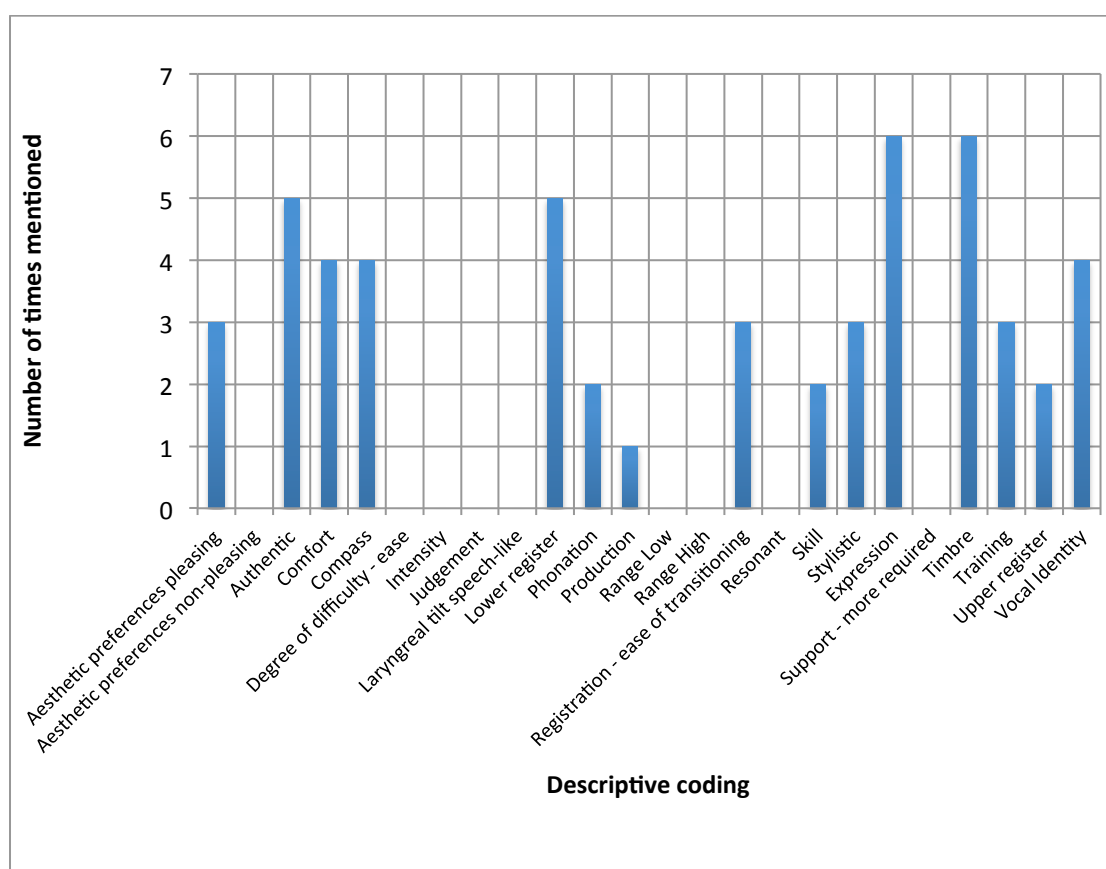
Figure 43. Subject B Own Practice

Please refer to figure 43 above for a tabled result of her interview. In the interview the most coded nodes in the analysis of Subject B were *Expression* and *Timbre.* In the interview Subject B linked timbre to her style of singing and that of her students. For example:

> I guess I have self-identified with being a soprano probably for the majority of my career. Umm, but I, I definitely, I mean my speaking voice is quite low and I can sing quite low so umm, it really, I think it's been maybe more to do with the sound that I really, that I like or the sound that feels honest, umm, I think that's why I have more self-identified with it because I think I could easily be an alto as well, if I wanted to self-identify with that.

It is interesting to note that in the interview, Subject B discussed her lower register to a greater degree than her preferred register of head mix. One wonders whether the singer had to spend more time working on this register because it did not come naturally to her.

Subject C
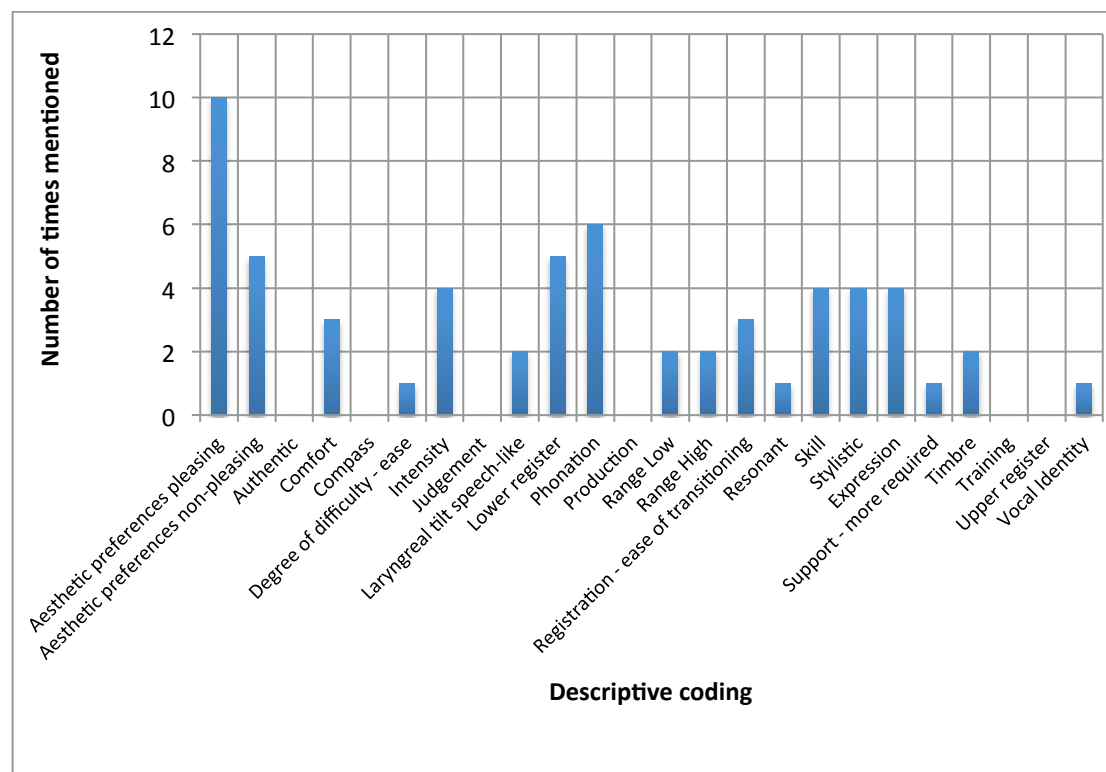
Figure 44. Subject C Own Practice

Please refer to figure 44 above for a tabled result of her interview. The node most often appearing in the data was aesthetic preference, with a total of ten occurrences. An example of Subject C discussing aesthetic preference is shown in the following quote from the interview: "I would say ah, previously it [my vocal preference] was probably my chest voice, but I'm starting to really enjoy singing in my head voice and, and mix as well. Um, but overall, I'd probably feel most comfortable singing in my chest voice."

Analysis and development of others' practice

Subject A
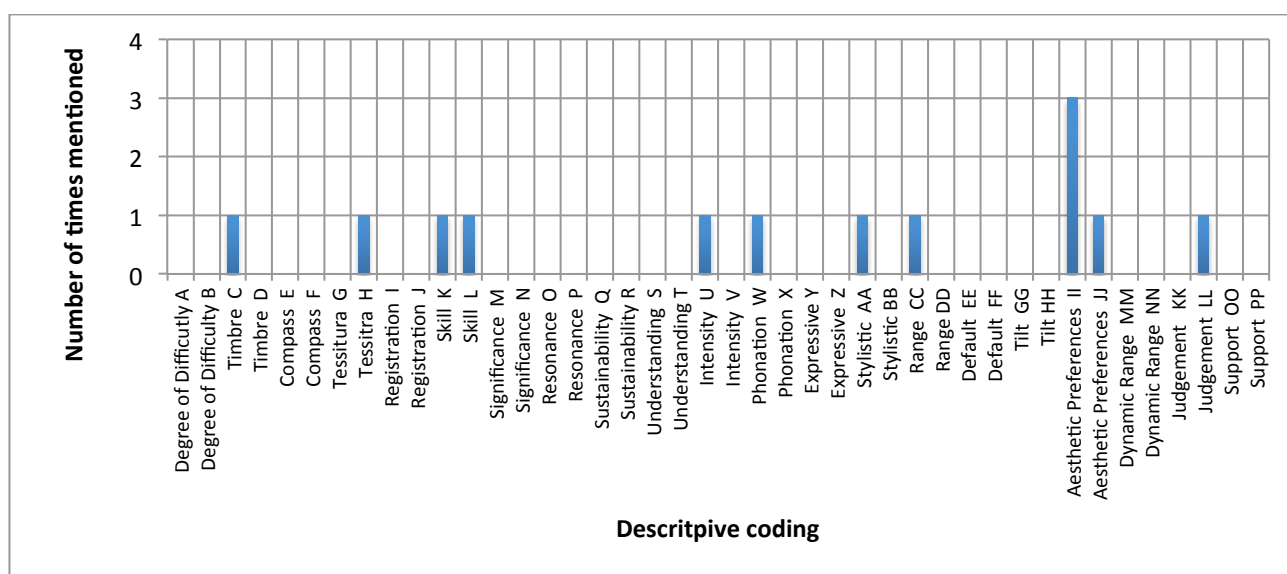
Figure 45. Subject A Others' Practice

Subject A discussed listening experiences to a lesser degree than Subjects B and C (please see figure 45 above which refers to Subject A's listening experiences). The main context in which she referred to listening experiences was in relation to her aesthetic preferences. An example of this can be found in the quote below, as she discusses her first vocal influence, Judy Garland: "[I liked] the sassiness and brassiness, the chest voice, 'cause as a child I sang exclusively in chest voice."

Subject B
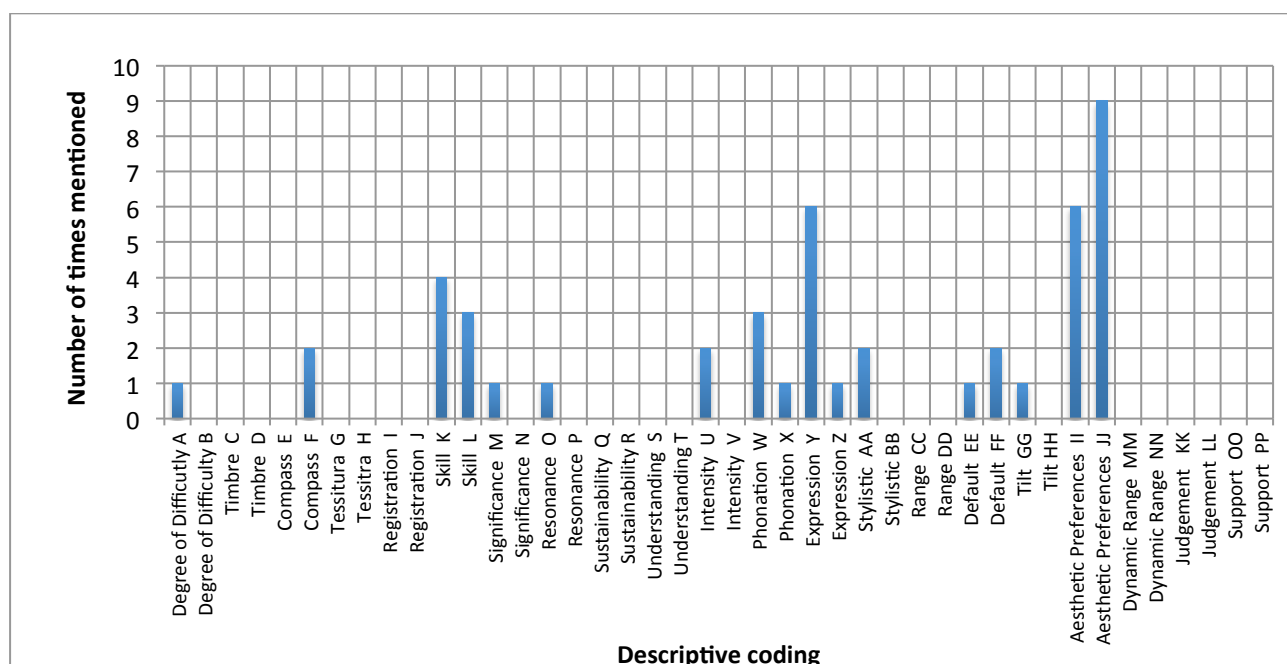
Figure 46. Subject B Others' Practice

Subject B mentioned her listening experiences throughout the interview (see figure 46 above). Most references were to the sounds she found pleasing and those that she disliked. Two examples of the quotes that were coded under listening experiences, or others' practice, are found below:

"Some of these big voices that have just a big fat breathy, you know, onset to the sound. I love those kinds of voices, like naturally big voices."

"I'd much rather listen to a sound that is fat, because you don't need to have a big voice to have a big presence in your sound."

Subject C
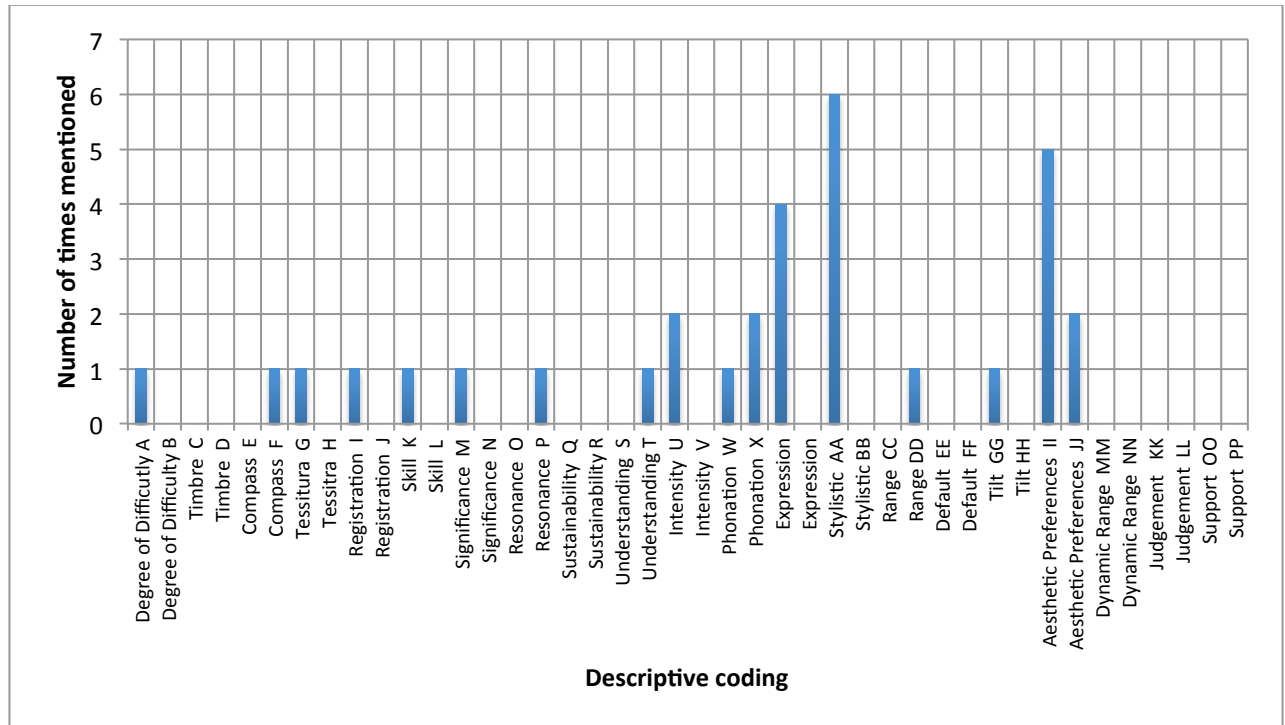
Figure 47. Subject C Others' Practice

Subject C frequently mentioned listening experiences in her interview, and these were often referred to in the context of vocal artists who had influenced her own style (see figure 47 above). Two examples follow: "I was really inspired by Subject B when she came to WAAPA last year. And I just love that pure, I'm really going, going towards loving that really pure tone again."

"I mean, probably Ella (Fitzgerald) would be one of my first vocal influences, and yeah, just that, just that richness of tone and the flexibility that she [Ella] has um, the richness and the smoothness and the flexibility of where her voice works when she is singing."

All of the subjects interviewed spoke about their listening experiences and their ability to listen objectively to singers from different genres. Listening experiences significantly dominated Subject B's and Subject C's interviews. Both of these subjects had a wide range of listening repertoire and drew upon these throughout the interview to compare and reflect on their own performance practice.

They regarded the listening experiences for each of the subjects as a significant experience that influences their voice and style.

Study Three: Analysis of Recorded Performances

Each of the nine singers who took part in this study answered a short questionnaire after recording their version of "Scarborough Fair". The participants' responses were compared with the profile that was created from the listening experts' survey responses. These results are listed below.

Participant 1: Professional singer

Audio example of Participant 1

Note: Audio example has been omitted due to ethics limitations.

Table 9:   Participant 1

Question	Answer
In which key did you choose to sing this song?	A minor
Which register did you use for the higher notes?	upper-register
Which register did you use for the lower notes?	mix-lower (chest?) register.
In what parts of the song did you feel you were singing *forte*?	In the lower part of the melody.
In what parts of the song did you feel you were singing *piano*?	Towards the ends of the phrases and at times in the upper-register.
Which register do you prefer to sing in?	Possibly the lower, but I like to explore different sounds in all registers.
Why do you prefer to sing in this register?	I feel that my sound is fuller and the tonal qualities are richer.

Figure 48. Listening Analysis of Participant 1

Please refer to table 9 above which refers to Participant 1's questionnaire answers and figure 48 above which refers to the listening analysis as answered by the listening experts.

Bars 43-45 were determined by the researcher as performed in a forte dynamic and bars 54-57 in a *piano* dynamic. These dynamic markings were placed on the score for the listening experts' reference.

The participant stated that she preferred to sing in her lower register, which was interpreted by the researcher as chest mix. She also stated that she liked to explore different sounds in the other registers. Two listening experts judged the song was performed in the chest mix register, and two listening experts assessed her singing as mix register.

The participant expressed that she felt she used her upper register for the higher notes in the song, whereas the listeners discerned that she used her mix register.

The participant and three of the listeners judged that she used chest mix for the lower notes of the song. One listener ascertained a balanced use of mix used for the lower notes of the song.

Participant 2: Secondary student

Audio example of participant 2:

Note: Audio example has been omitted due to ethics limitations.

Table 10: Participant 2

Question	Answer
In which key did you choose to sing this song?	C minor
Which register did you use for the higher notes?	mix
Which register did you use for the lower notes?	chest/mix
In what parts of the song did you feel you were singing *forte*?	"Parsley, sage, rosemary and thyme, remember me…" that part.
In what parts of the song did you feel you were singing *piano*?	The verses, "tell him to make me…"
Which register do you prefer to sing in?	mix
Why do you prefer to sing in this register?	It's not too heavy or light/airy – I like the way it sounds best.

Figure 49. Listening Analysis of Participant 2

Please refer to table 10 above which refers to Participant 2's questionnaire answers and figure 49 above which refers to the listening analysis as answered by the listening experts.

Bars 6-7 were assessed by the researcher as performed in a *forte* dynamic and bar 55-57 in a *piano* dynamic. These dynamic markings were placed on the score for the listening experts' reference.

The participant stated that she preferred to sing in mix register when singing, however the listeners were unanimous in their observation of her register as chest mix.

The participant stated that she used the mix register for the highest notes in the song, but the panel of experts did not observe this. Three of the expert listeners assessed the songs as performed in chest mix and one expert listener described the song as performed in head mix.

The participant stated that she used her chest mix register when singing the lower notes and this was unanimously agreed upon by the panel of experts.

Participant 3: Professional singer

Audio example of Participant 3:

Note: Audio example has been omitted due to ethics limitations.

Table 11: Participant 3

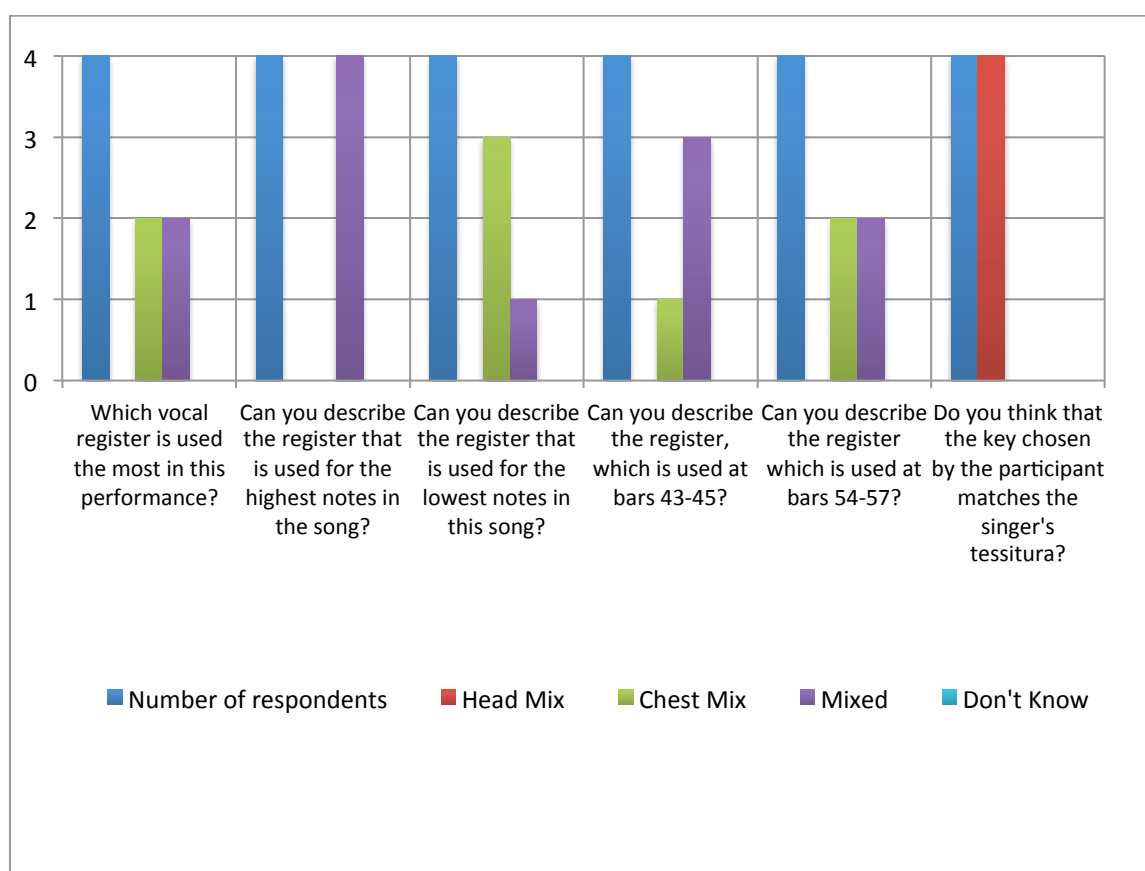| Question	Answer
In which key did you choose to sing this song?	B minor
Which register did you use for the higher notes?	Mix
Which register did you use for the lower notes?	Chest
In what parts of the song did you feel you were singing *forte*?	Where the melody was higher I was probably louder.
In what parts of the song did you feel you were singing *piano*?	beginning 1st verse.
Which register do you prefer to sing in?	chest and mix
Why do you prefer to sing in this register?	I like the richer and relaxed feeling.

Figure 50. Listening Analysis of Participant 3

Please refer to table 11 above which refers to Participant 3's questionnaire answers and figure 50 above which refers to the listening analysis as answered by the listening experts.

Bar 6 was determined by the researcher as performed in a *forte* dynamic and bars 56-57 in a *piano* dynamic. These dynamic markings were placed on the score for the listening experts' reference.

As can be seen in the table of responses, the participant stated that she preferred to sing in her chest and mix registers. One listener described the song as performed in chest mix register, and three listeners described the song as performed in mix register. This description of chest mix fits with the participant's preferred register.

The participant stated that she used her mix register for the highest notes. One expert listener described the register that was used for the highest notes as head mix and three listeners described the register used as mixed register.

The participant stated that she used her chest mix register for the lower notes of the song. One listener described the register used for the lowest notes in the song as chest mix, and the other three described the register in use for the lowest notes of the song as mixed register.

Participant 4: Tertiary student

Audio example of Participant 4:

Note:

Audio example has been omitted due to ethics limitations.

Table 12: Participant 4

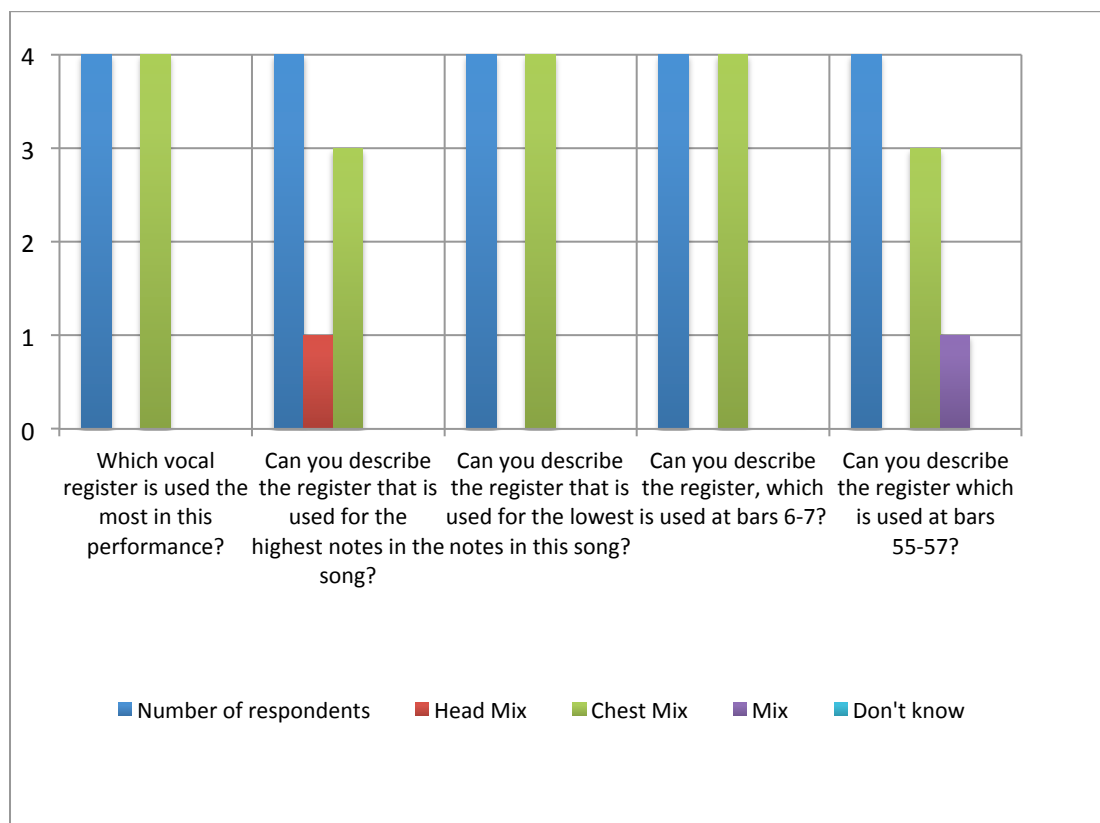| Question	Answer
In which key did you choose to sing this song?	B flat minor
Which register did you use for the higher notes?	head register.
Which register did you use for the lower notes?	mixed voice – blend of head and chest, chest only for a few notes.
In what parts of the song did you feel you were singing *forte*?	"Generally through, "rosemary and thyme", in the third line – highest parts of song and beginning of third verse.
In what parts of the song did you feel you were singing *piano*?	Beginning and end of verses.
Which register do you prefer to sing in?	It really depends on the genre that I'm singing.
Why do you prefer to sing in this register?	I love singing so many different genres of music (contemporary/pop songs, jazz, funk, soul/r'n b) and haven't defined myself as an artist in one specific genre, so when I sing different genres I use different registers of my voice and I love embracing the different vocal registers that each genre requires eg. head voice/mixed for jazz, chest for funk/soul.

Figure 51. Listening Analysis of Participant 4

Please refer to table 12 above which refers to Participant 4's questionnaire answers and figure 51 above which refers to the listening analysis as answered by the listening experts.

Bar 43 was assessed by the researcher as performed in a *forte* dynamic and bars 54-56 in a *piano* dynamic. These dynamic markings were placed on the score for the listening experts' reference.

The researcher would like to note that there appeared to be a glitch in the survey and there were some instances where only three expert listeners answered the questions. One of these instances occurred in the case of Participant 4.

The participant did not elect a preferred register. One listening expert described the register in use as chest mix, and two listeners heard it as mix register.

The participant stated that she used her head mix register for the highest notes. One listening expert judged the participant to have used head mix register and the other two listening experts described mix register as being used for the higher notes.

The participant stated that she used mix register for the low notes. One listener described the register used for the low notes as chest mix, and two listeners

ascertained mix register was used for the low notes, which was in line with the participant's description.

Participant 5 Tertiary student

Audio example of Participant 5:

Note: Audio example has been omitted due to ethics limitations.

Table 13: Participant 5

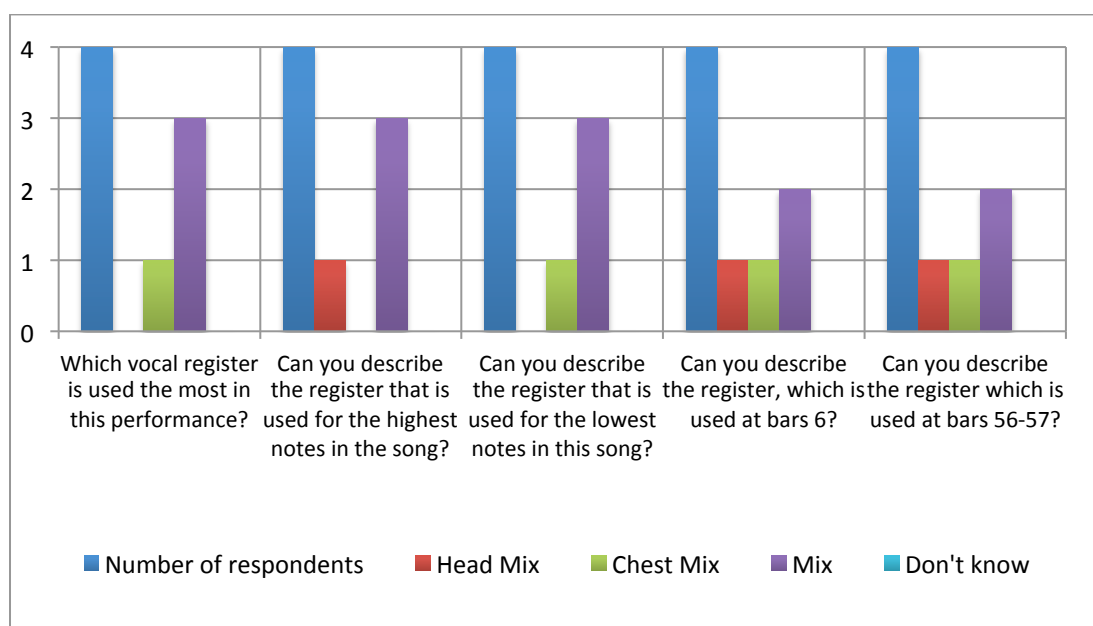| Question	Answer
In which key did you choose to sing this song?	B minor
Which register did you use for the higher notes?	Mix
Which register did you use for the lower notes?	Chest
In what parts of the song did you feel you were singing *forte*?	2nd line (2nd phrase) Parsley/sage.
In what parts of the song did you feel you were singing *piano*?	1st line/Last line (1st phrase) (4th phrase)
Which register do you prefer to sing in?	Chest
Why do you think you prefer to sing in this register?	sits comfortably/like to sing lower.

Figure 52. Listening Analysis of Participant 5

Please refer to table 13 above which refers to Participant 5's questionnaire answers and figure 52 above which refers to the listening analysis as answered by the listening experts.

Bar 6 was determined by the researcher as performed in a *forte* dynamic. Bars 47-48 were determined by the researcher as performed in a *piano* dynamic.

The participant asserted that chest register was her preferred register. Three listeners also regarded chest mix register as the dominant register used throughout the performance, whereas one listener described mix voice as the dominant register.

The participant claimed that mix register was used during the high notes. Two listeners confirmed that mix register was used during the high notes, whereas two listeners assessed that chest mix register was used for the highest notes.

The participant believed that chest mix register was used for the lower notes during the performance. All the listeners agreed that chest mix register was used for the lowest notes in the song.

Participant 6: Professional singer

Audio example of Participant 6:

Note: Audio example has been omitted due to ethics limitations.

Table 14: Participant 6

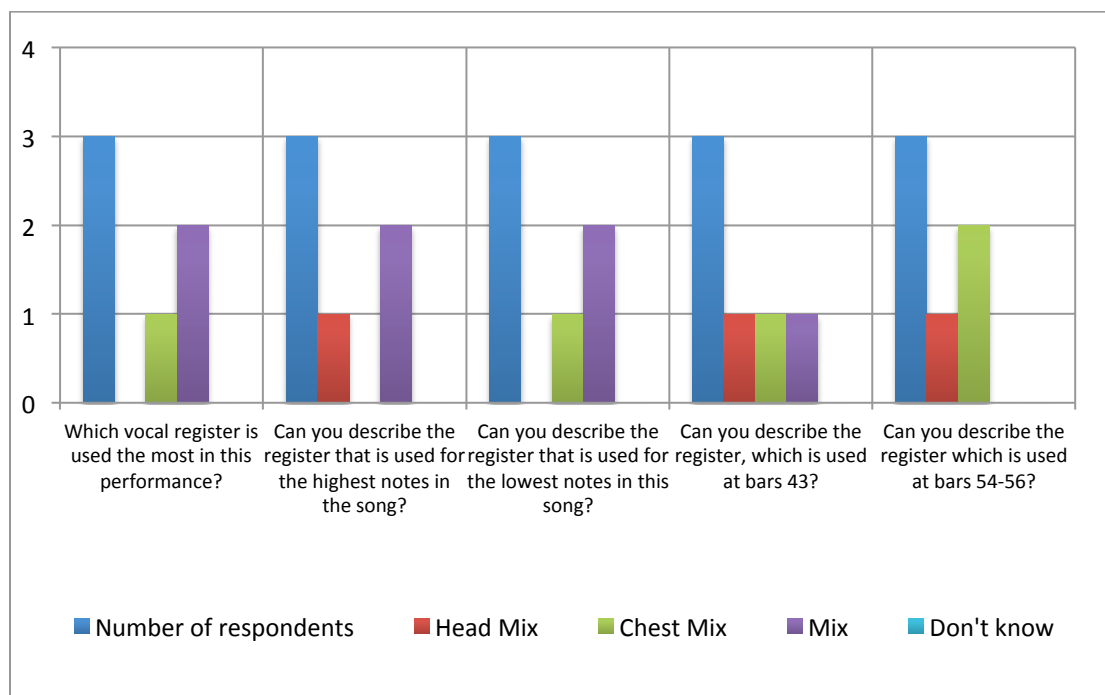| Question	Answer
In which key did you choose to sing this song?	A minor
Which register did you use for the higher notes?	head
Which register did you use for the lower notes?	chest
In what parts of the song did you feel you were singing *forte*?	The beginning and the beginning of the second half of the end.
In what parts of the song did you feel you were singing *piano*?	The ends of the phrases.
Which register do you prefer to sing in?	I don't have a preference – it depends on the style of the music and song. I like singing certain songs in chest and mix.
Why do you prefer to sing in this register?	Because I feel I am putting more of my body behind my instrument.

Figure 53. Listening Analysis of Participant 6

Please refer to table 14 above which refers to Participant 6's questionnaire answers and figure 53 above which refers to the listening analysis as answered by the listening experts.

Bar 16 was ascertained by the researcher as performed in a *forte* dynamic and bar 37 in a *piano* dynamic. These dynamic markings were placed on the score for the listening experts' reference.

The participant did not state a preference for register in the questionnaire; however, she stated that she would use chest or mix register and omitted head register completely. It could be deduced from this statement that head register was not preferred because it was omitted completely. Three listeners judged chest mix register and one mix register as the dominant voice used in this performance.

The participant stated that she used her head mix register when singing the higher notes of the song. Three expert listeners assessed that the highest notes were sung in head mix register, and one participant thought the highest notes were sung in mix register.

The participant stated that she used her chest mix register for the lowest notes in this performance, and the listening experts unanimously corresponded with this description of register use.

Participant 7: Secondary student

Audio example of Participant 7:

Note: Audio example has been omitted due to ethics limitations.

Table 15:   Participant 7

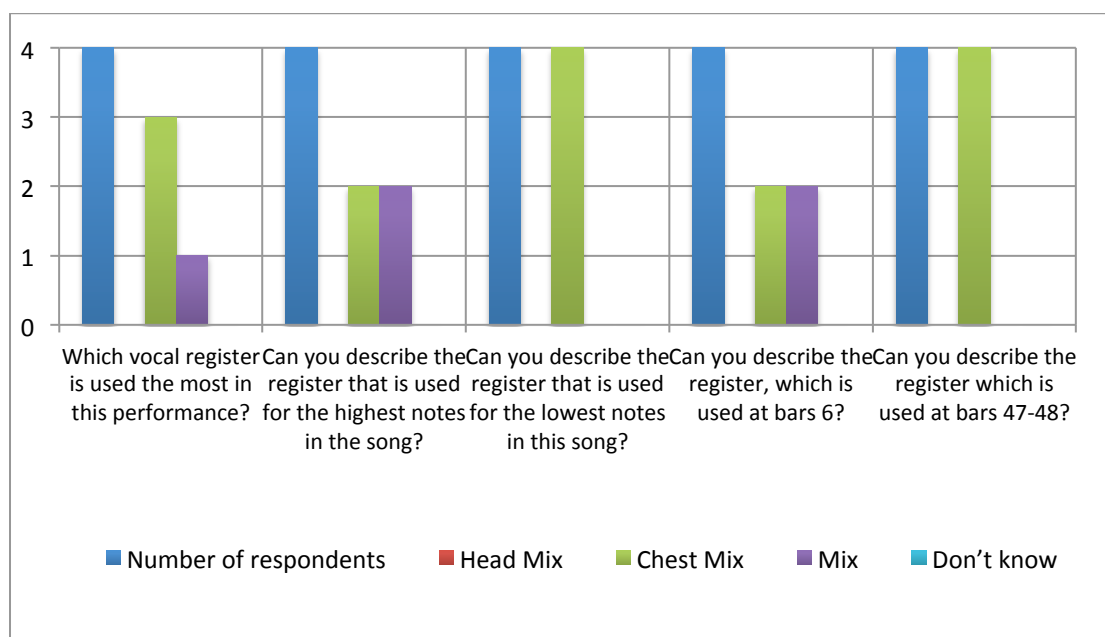| Question	Answer
In which key did you choose to sing this song?	D sharp minor
Which register did you use for the higher notes?	upper register
Which register did you use for the lower notes?	Mostly lower, but sometimes upper.
In what parts of the song did you feel you were singing *forte*?	The higher notes of the song.
In what parts of the song did you feel you were singing *piano*?	The lower notes and at the end of phrases because of the use of a decrescendo.
Which register do you prefer to sing in?	Upper register.
Why do you prefer to sing in this register?	It is much easier for me to sing in that register and I feel there's much less tension and strain when I sing in the higher register.

Figure 54. Listening Analysis of Participant 7

Please refer to table 15 above which refers to Participant 7's questionnaire answers and figure 54 above which refers to the listening analysis as answered by the listening experts.

Bar 6 was assessed by the researcher as performed in a *forte* dynamic and bar 31 in a *piano* dynamic. These dynamic markings were placed on the score for the listening experts' reference.

The participant stated that her preferred register was her upper register, and this was interpreted as head mix. Two listeners regarded the dominant register as head mix, and two listeners assessed the dominant register as mix register.

The participant stated that she sang the highest notes of the song in her upper register, which was interpreted as head mix register. Three of the expert listeners' judgments corresponded with the participant's, and one expert listener stated that the highest notes were performed in mix register.

The participant stated that she used her lower register "but sometimes upper" register for the lowest notes of the song. This has been interpreted as a dominant use

of chest mix register for the lower notes of the song. The listening experts unanimously asserted the lowest notes were performed in mix register.

Participant 8: Secondary student

Audio example of Participant 8:

Note: Audio example has been omitted due to ethics limitations.

Table 16:   Participant 8

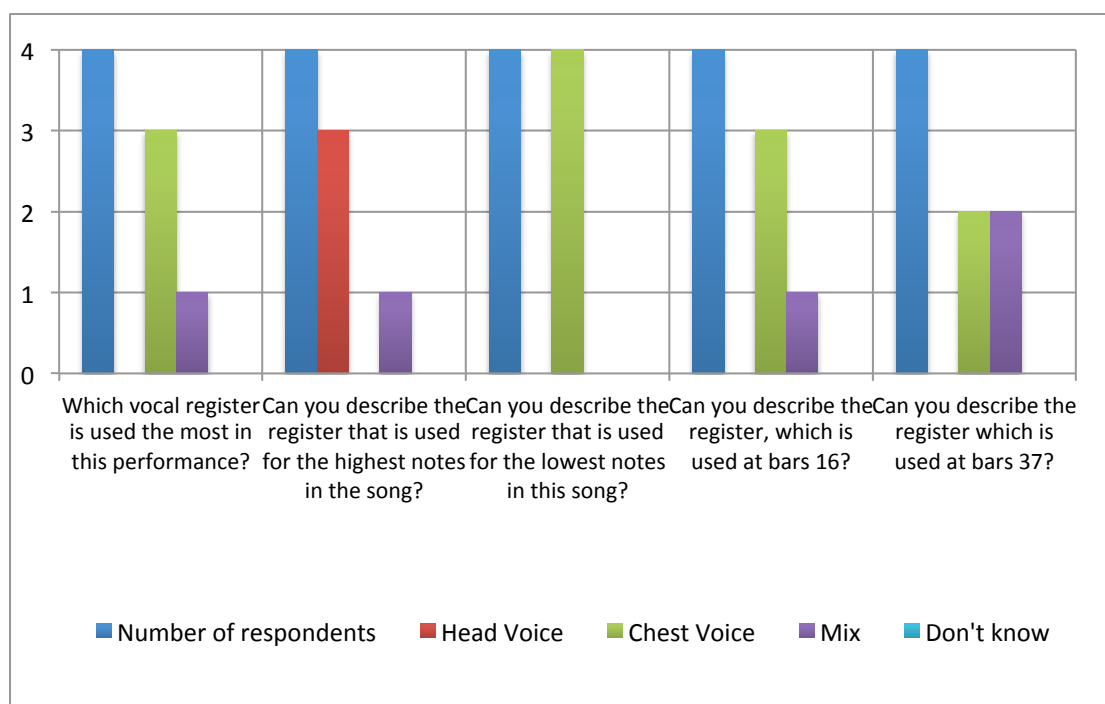| Question	Answer
In which key did you choose to sing this song?	C minor
Which register did you use for the higher notes?	lower register – chest voice.
Which register did you use for the lower notes?	lower register – chest voice.
In what parts of the song did you feel you were singing *forte*?	The top notes, "sage" & "remember".
In what parts of the song did you feel you were singing *piano*?	On the first and last phrases (end of song) "mine" and "are" (beginning of song)."
Which register do you prefer to sing in?	middle
Why do you prefer to sing in this register?	Because I believe it is the most developed and I am comfortable in singing in this register. I also have more control, which gives me more confidence and allows for more emotional execution.
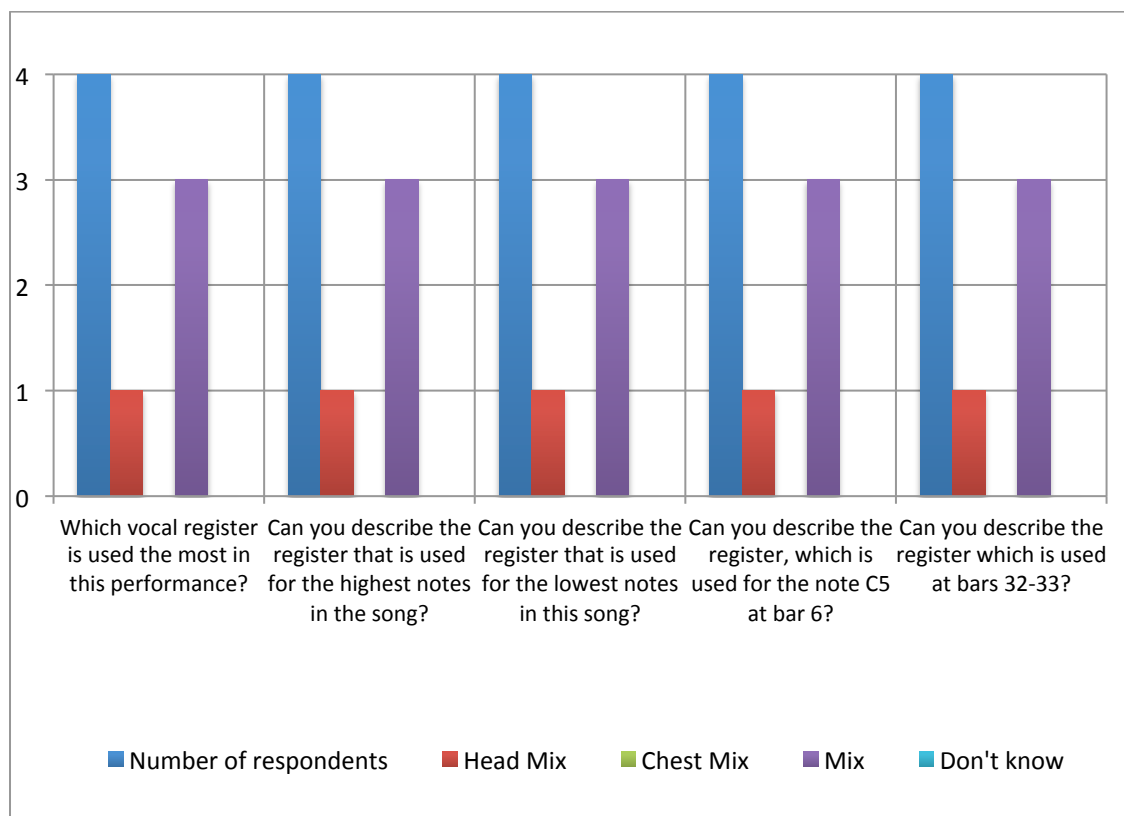
Figure 55. Listening Analysis of Participant 8

Please refer to table 16 above which refers to Participant 8's questionnaire answers and figure 55 above which refers to the listening analysis as answered by the listening experts.

Bar 6 was determined by the researcher as performed in a *forte* dynamic and bars 32-33 in a *piano* dynamic. These dynamic markings were placed on the score for the listening experts' reference.

The participant stated that she preferred to sing in her lower register. Three of the listeners judged that she was singing in mix register, and one listener stated that they thought she was singing in chest mix register.

The participant stated she performed the high notes of the song in her lower voice or chest mix voice. One listener also judged that the participant performed the higher notes in her chest mix; three other expert listeners assessed the participant's higher notes as being in mix register.

The participant stated that she performed the lower notes in chest mix register. Again, one listener believed the participant was performing the lowest notes

in chest mix, and the three other listeners thought that the participant was singing in a balanced mix for the lowest notes.

Participant 9: Tertiary student

Audio example of Participant 9:

Note: Audio example has been omitted due to ethics limitations.

Table 17:   Participant 9

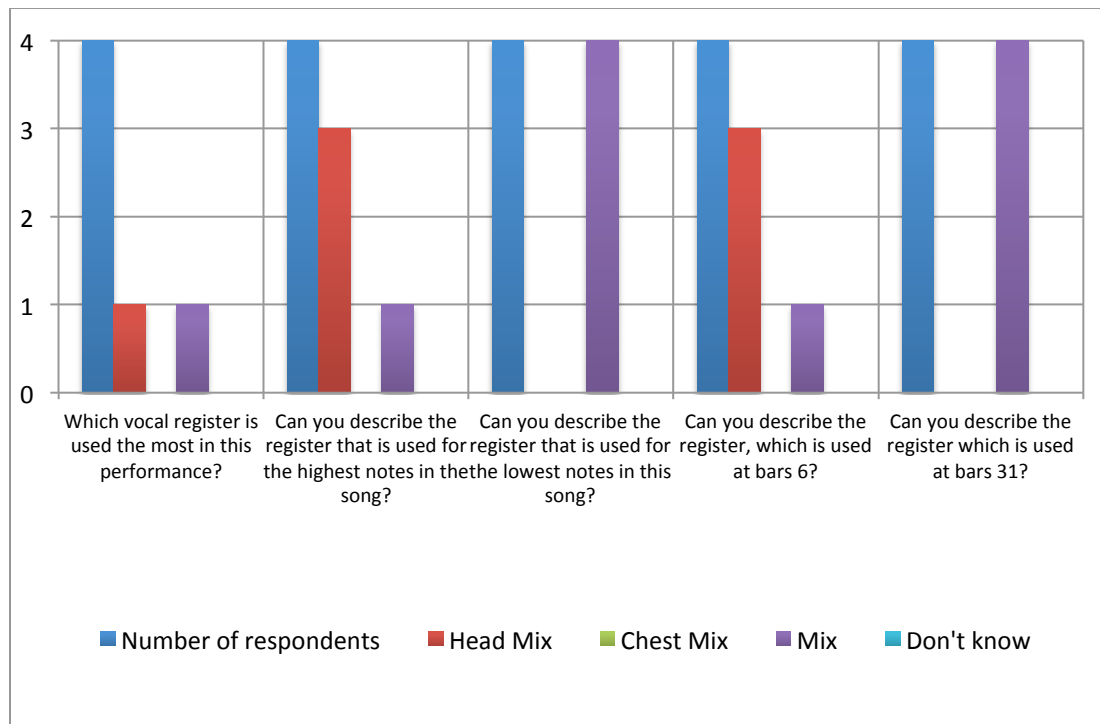| Question	Answer
In which key did you choose to sing this song?	C minor
Which register did you use for the higher notes?	mix
Which register did you use for the lower notes?	Mix
In what parts of the song did you feel you were singing *forte*?	"Parsley, sage, rosemary and thyme" "Remember me". All three verses.
In what parts of the song did you feel you were singing *piano*?	"Then she'll be a true love of mine," : last time. "Are you going…" all three verses.
Which register do you prefer to sing in?	Mix
Why do you think you prefer to sing in this register?	It can be soft, delicate and pretty (when using more thin fold song), but it also has power and passion (more thick fold and belt). It also allows me to sing in many ranges e.g. Alto/soprano.
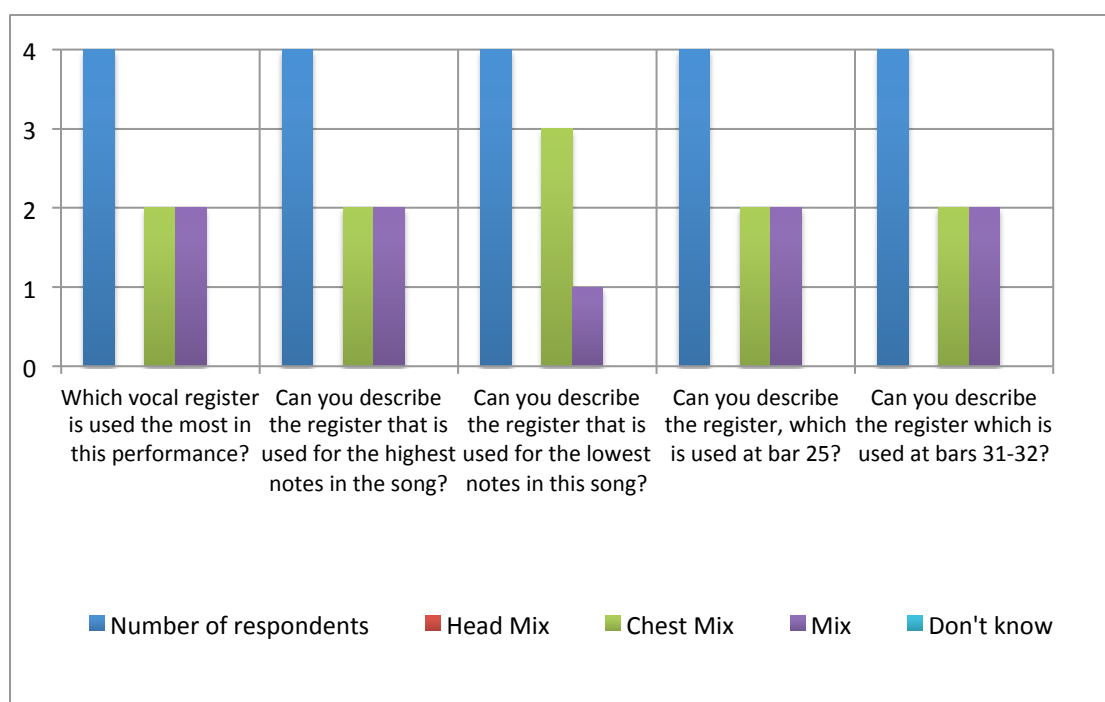
Figure 56. Listening Analysis of Participant 9

Please refer to table 17 above which refers to Participant 9's questionnaire answers and figure 56 above which refers to the listening analysis as answered by the listening experts.

Bar 25 was assessed by the researcher as performed in a *forte* dynamic, bars 31-32 in a *piano* dynamic. These dynamic markings were placed on the score for the listening experts' reference.

The participant stated that she preferred to sing in mix register. Two expert listeners described her performance as mix register, and the other two expert listeners thought she performed in chest mix register.

The participant stated that she performed the high notes of the song in mix register. Two expert listeners' assessment corresponded with the participant and two expert listeners judged that the high notes of the song were performed in chest mix register.

The participant stated that she performed the low notes of the song in mix register. However, three expert listeners regarded the low notes as performed in chest mix register, and one participant thought it was performed in mix register.

Tessitura
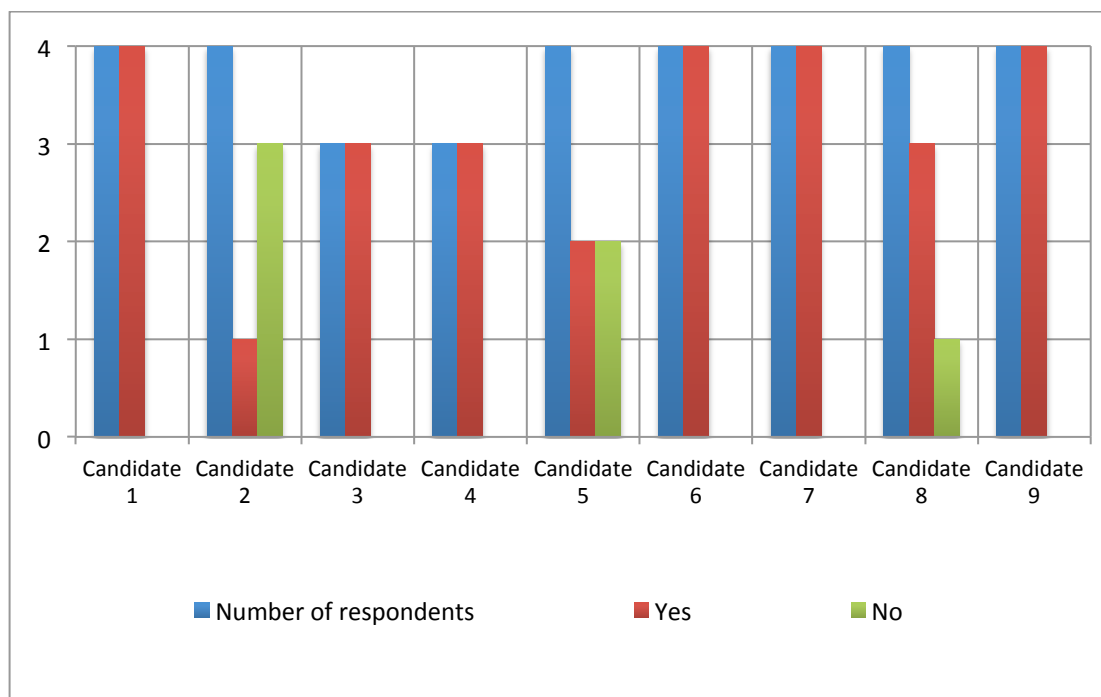
Figure 57. Tessitura of Participants for Study Three

For Study Three, the researcher wanted to clarify whether the singers had chosen to sing in a suitable key for their voice. In order to make this clarification, the question was asked of the expert listeners: "Do you think that the key chosen matched the singer's tessitura?" Three expert listeners commented "no" for Participant 2, two expert listeners commented "no" for Participant 5, and one expert listener commented "no" for Participant 8. These three participants are students, two of whom are secondary, and one is tertiary. No professional singers were judged to have chosen a key that did not match her tessitura (see figure 57 above). This could reflect on the experience that singers acquire throughout training and performance that results in a greater understanding of their voice.

Vocal Style

Table 18:   Vocal Influences of Participants for Study Three

Who are your vocal influences?	
Participant 1	Tierney Sutton, Joni Mitchell, Anita Wardell, Becca Stevens, Vince Jones, Ella Fitzgerald, Sarah Vaughan, Chet Baker.
Participant 2	Tracey (singing teacher), Mum (Coralie Khan). In the way of the famous…Joni Mitchell, Kate Bush
Participant 3	Kate Bush, Tori Amos, Joni Mitchell, Mary Blach, Cara Dillon, Kate Rusby, Eva Cassidy.
Participant 4	Esperanza Spalding, Kristin Beradi, Alicia Keys, Ella Fitzgerald, Norah Jones, Gretchen Parlato, Vince Jones, Frank Sinatra, Beyonce, Christina Aguilera. (So many!)
Participant 5	Beyonce, Idina Menzel, Ella Fitzgerald, Audra McDonald
Participant 6	Ella Fitzgerald, Sarah Vaughan, Billie Holliday, Elis Regina, Chaka Khan, Natalie Cole, Chet Baker, Frank Sinatra and many more. Bebel Gilberto, David Bowie, Prince.
Participant 7	Cecillia Bartolli [sic], Julie Andrews, Maria Calas [sic], Brandi Carlile, Regina Spektor.
Participant 8	Mariah Carey and Whitney Houston because of their ability to change registers with ease and equal power.
Participant 9	Delta, Christina Aguilera, Sutton Foster, Patty Lapone and other broadway [sic] performers.
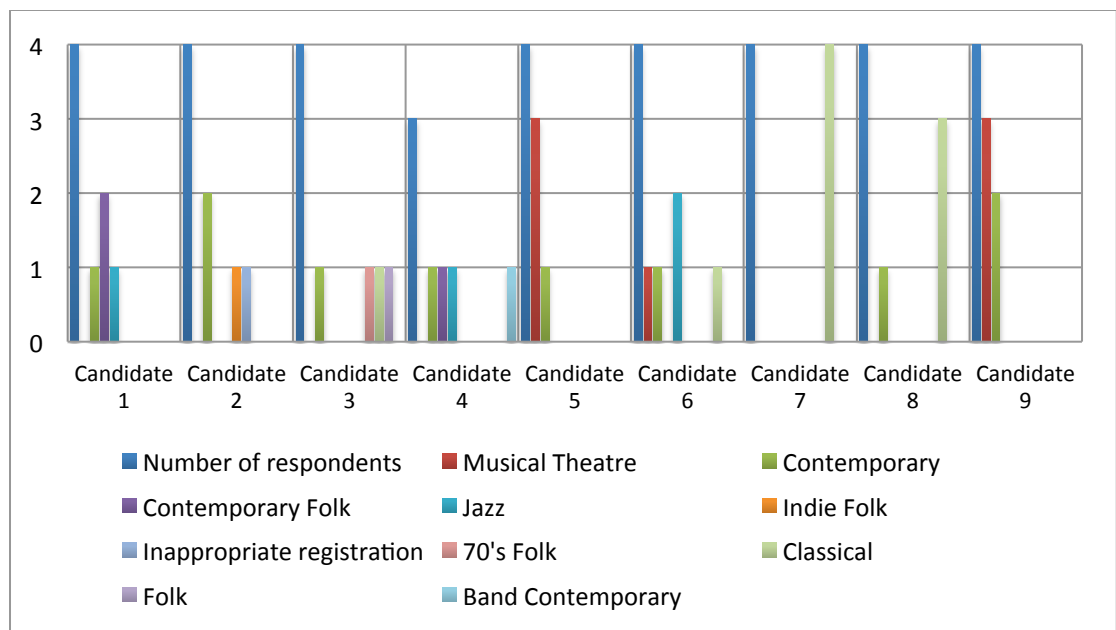
Figure 58. Listening influences of participants for Study Three

The participants listed their vocal influences and then their answers were compared with stylistic influences as detected by the four expert listeners (see figure 58 above). This enquiry related to research question three: Can these [register preferences] be traced in recorded performances?

Participant 1 professed listening influences dominated by jazz singers. However, only one expert listener described jazz style as present in her performance of "Scarborough Fair". Two respondents recognized contemporary folk style and this is in keeping with some of the participant's listening experiences. One listening expert nominated a contemporary style, which was not consistent with the participant's listening experiences.

Participant 2 expressed a dominant listening experience of contemporary and folk. Two listeners recognized contemporary style in the participant's performance, and one listener recognized Indie Folk. These are in keeping with the participant's listening experiences.

Participant 3 stated that she listened predominantly to folk singers. Two expert listeners recognized folk style in the participant's performance, one expert listener recognized classical style, and another expert listener recognized contemporary style in the participant's performance.

Participant 4 acknowledged the influences of jazz and contemporary performers in her listening experiences. One expert listener recognized jazz style in the participant's performance, one expert listener recognized contemporary style in the participant's performance, and one listener recognized contemporary folk in the participant's performance.

Participant 5 nominated contemporary, musical theatre and jazz influences amongst her listening experiences. Three expert listeners recognized musical theatre style in the participant's performance, and one expert listener recognized contemporary style in the participant's performance. This was in keeping with the participant's listening experiences.

Participant 6 proposed jazz and Brazilian music and contemporary influences in her listening experiences. One listening expert recognized jazz style in the participant's performance, one recognized musical theatre, one recognized classical,

and one listener recognized jazz and contemporary style in the participant's performance.

Participant 7 listed alternative folk rock, classical and musical theatre influences in her listening experiences. All of the expert listeners unanimously recognized classical style in the participant's performance.

Participant 8 put down contemporary style in her listening experiences. One expert listener recognized contemporary style in the participant's performance, and three expert listeners recognized classical style in the participant's performance.

Participant 9 stated that her listening experiences were musical theatre and contemporary styles. Two expert listeners recognized musical theatre style in the participant's performance; one recognized contemporary style and one recognized musical theatre and contemporary in the participant's performance.

The data revealed that listening preferences could be traced in most of the singer's performances. There were some styles that were detected by the listeners even though the singer was not trained in the genre, nor did they list it as a listening influence. Nevertheless, overall, participants' listening experiences were traced in their performance.

Register use and dynamics

Forte
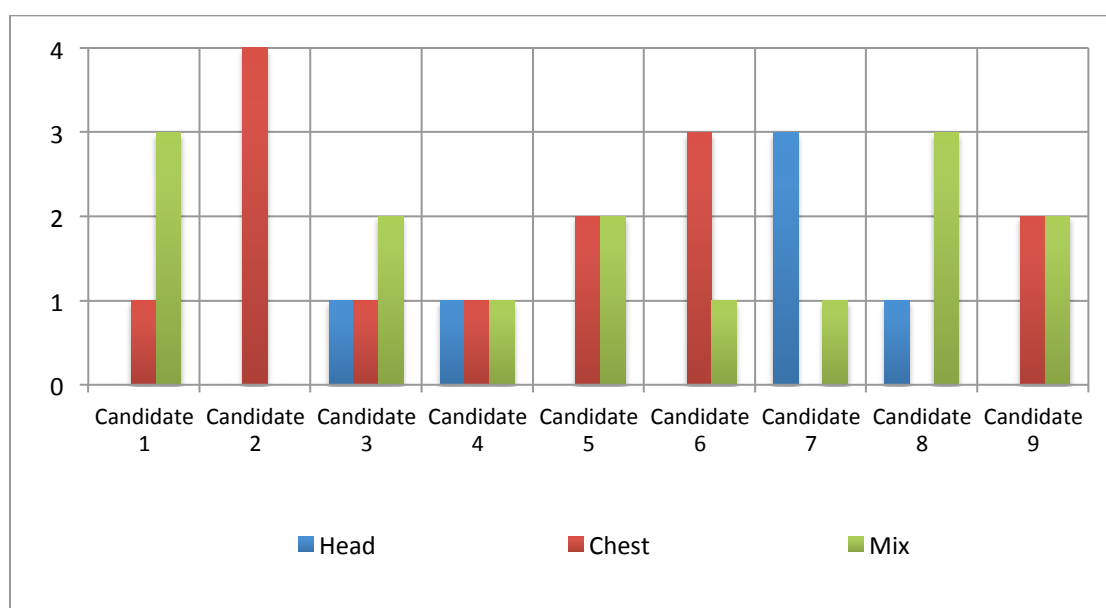
Figure 59. Register Use in a F*orte* **Dynamic**

There were fourteen descriptors of chest mix register used to describe the *forte* dynamic; fifteen descriptors of mix register were used for this dynamic and six descriptors of head mix register used for this dynamic (see figure 59 aobve). This pattern is similar to the pattern from Study One, where chest mix was described as predominantly used for *forte* dynamics and for intensity.

Piano
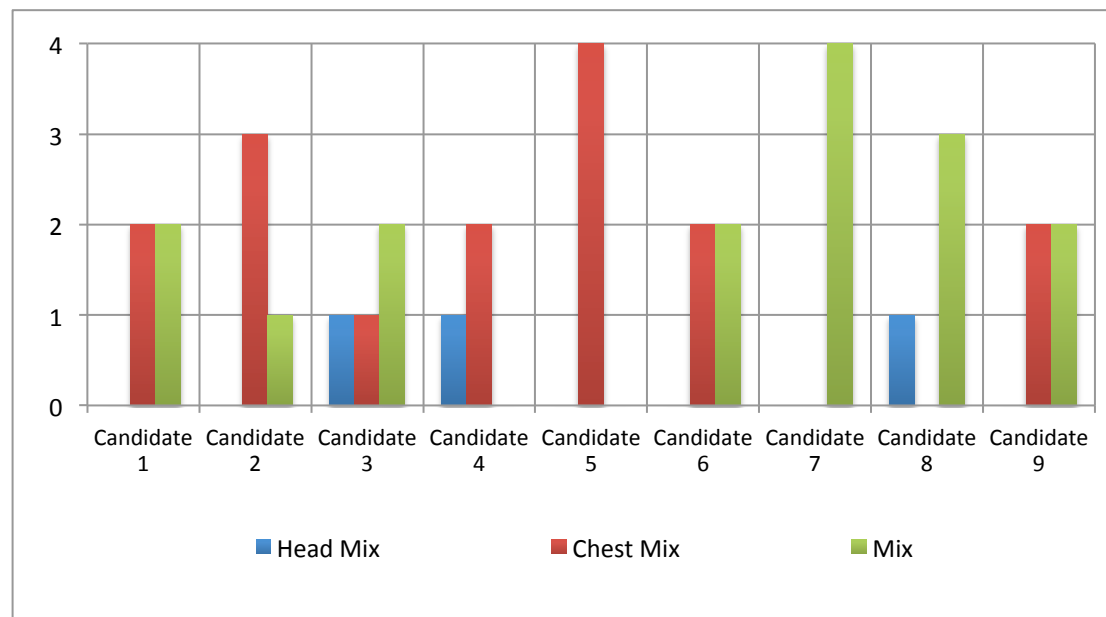
Figure 60. Register Use in a P*iano* **Dynamic**

There were sixteen descriptors of chest mix register used in the *piano* dynamic, sixteen descriptors of mix register used in this dynamic, and three descriptors of head mix register used in this dynamic (see figure 60 above). This is not in keeping with the pattern of register use in Study One when head mix was nominated predominantly for *piano*. However, it does fit with the pattern from Study One that chest mix register is used predominantly amongst performers of CCM style.

Throughout this study, the panel of listening experts agreed most with the professional participants, and least with the secondary students. From this result it would seem that extensive training and broad listening experiences do result in the singers' vocal preferences being more accurately produced and traced in performance. This result will be discussed thoroughly in the following chapter.

In summary, this chapter reviewed the results from Studies One, Two and Three of the research project. The main theme of Study One was that mix register seemed to elicit the least number of comments. The cohort of participants seemed to

still regard the voice as having two main parts i.e. chest mix register for low, loud notes and head mix register for softer, higher tones. "The chest voice has two meanings; the predominant and probably more traditional one is merely the lower segment of the female voice; the other is used to denote a hard, pinched, brassy quality in that same area…There are some who think this brassy sound is the only one which can be made in this pitch area and therefore the lower voice should never be used. This is a bad mistake, for the bad sound results from a constricted throat and an elevated larynx. If the resonators are adjusted properly, it is possible for a woman to sing just as low and with a much more beautiful quality than the woman with the "chesty" sound (McKinney, 2005, p. 195). As McKinnery notes:

> After listening to singers in hundreds of public performances – in recital, opera, oratorio, and orchestral concerts – including many of the world's most acclaimed singers, this writer is convinced that the great majority of them sing almost exclusively in modal voice. When they use falsetto in public performance, it serves two main purposes: (1) to make available very high pitches which are above the range of the modal register, and (2) to make available some pianissimo tones that would be very difficult to sing in the modal register." (McKinney, 2005, p. 99)

The main theme emerging from Study Two was that the three professional singers did have a register preference but this preference was not limited by their listening experiences. The professional singers continued to warm-up their entire vocal range even when they chose not to use parts of their range in their performance.

The results of Study Three revealed that register preferences were traceable in performance and that training and listening experiences did impact on how accurately the singers were able to express themselves.

In the following chapter, the researcher will explain the results of each of the studies in greater detail and then triangulate these results to speculate on common findings. The researcher will discuss how her teaching of singing was influenced whilst undertaking the research. Finally, future research ideas will be considered.

CHAPTER FIVE: DISCUSSION AND CONCLUSIONS

In this chapter the researcher outlines how the research evolved through each of the three studies. The results of each study are described and explained in further detail. The findings that emerged from each study are discussed and the limitations discovered during the research process are clarified. The findings from each of the studies are also compared for similarities, connections and overall patterns. Finally, applications of these findings for the teaching studio and for future research on middle register preference are considered

From the results of the data analysis of each study, it is reasonable to conclude that singers do have a preference for using a particular register in their middle range i.e. either chest mix or head mix. This preference is present in pre-professional singers in training as well as in professional singers. The implications of singer register preference could be useful for the teacher to consider when instructing a student to sing outside of their preferred register. This implication could also be useful to the singer herself for self-reflective purposes.

Study One: Questionnaires

Looking at the data from the questionnaire of Study One, the vocal register that elicited the least number of comments was mix register. Data that were collected on the mix register included singers' comments pertaining to the importance of this register in regards to the overall health of their voice. However, there was not much more that could be drawn from the participants on mix register. For example, there were no participants who claimed to understand the mix register; neither were there participants who discussed the timbre of mix register. The lack of discussion regarding mix register and its application could be evidence that the cohort of participants did not know how to talk about this register. Moreover, the data did show that the participants believed that mix register was significant. It would seem that the participants did not have enough understanding of this register to make any further comments.

The data collected revealed that head mix register was associated with high range and weak intensity, whereas chest mix register was associated with low notes and strong intensity. Arguably, this finding further supported the proposition that

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mix register is not well understood and therefore the voice was conceived as having two parts to it: chest for low and strong and head for high and weak. The chest and head registers were favoured by an equal number of participants, and this is of interest to the researcher because at this point it seemed there was not a particular preferred register amongst singers of contemporary music.

As mentioned in the methodology chapter, the questionnaire results were divided into two categories. One category was for comments that referred to vocal production, or own practice, and the other category was for comments pertaining to listening experiences, or others' practice. The data collected on listening experiences was considerably smaller than the data collected on vocal production. This is of interest because the professional singers had discussed in great detail their listening experiences. Since the cohorts of participants for the questionnaire were mostly secondary and tertiary students, the researcher assumed listening was a habit that professional singers developed after training.

If listening is an important factor in the development of the vocalist, it was evident from the data that secondary and tertiary students were not listening to other singers to a significant degree and were generally unaware of the benefits of listening to other singers. In her article, "A guide to Evaluating Musical Theatre for the Classical Teacher", Balog (2005) remarks on the importance of listening: "[it] is extremely important for voice teachers to listen to professionals on recordings or in live performances to learn these sounds, to understand their production, and to distinguish among them." (J. E. Balog, 2005, p. 401) Thus both the data and the literature indicate that there is a benefit when singers listen to professionals on recordings and live performances.

Limitations

As with the study of the three professional singers of Study Two, the researcher pursued the link between personality and vocal identity. On examining the questionnaire responses, the researcher realized that by looking at cultural and familial influences she had cast the net too wide. Therefore, there were responses from the questionnaire that were disregarded as outside the parameters of this research.

Another limitation of the Study One data collection was the disproportionate number of secondary students compared to tertiary and professional singers. Out of the 57 participants, 26 were students (45%). This realization lead to the decision in Study Three to include equal numbers of secondary, tertiary and professional singers.

A further limitation in this questionnaire was the wording of the following three questions: "What are your opinions about chest voice?", "What are your opinions about mix voice?" and "What are your opinions about head voice?". The vagueness of these questions elicited a range of responses that were too broad for rigorous analysis. For example, some participants discussed their personal opinions about singing in these voice classifications, and some participants discussed their experiences when listening to other singers perform in these voice classifications. As a consequence, the researcher separated the data into two categories: own practice and others' practice (listening experiences). This separation was continued in Study Three (the nine case studies questionnaire) by constructing more direct questions.

Upon analysis of the data of Study One, there did seem to be a preference amongst the participants for using either chest or head registers. However, upon reflection, the researcher realized that she had not given the participants an option for declaring that they did not have a preference. This could have been offered as an answer to the participant, but the option was not provided. This limitation in questioning was later addressed in the questionnaire design for the nine case studies. The participants of the case studies were asked if they did have a register preference, and in order to make the topic of register preference more definite, the researcher gave the respondents the opportunity to say that they did not have a preference.

Conclusions

The researcher concluded from this data collection that mix register was the least understood of the three registers. This misunderstanding of mix register adds to the argument that was evident in the literature review regarding the limited amount of information available to singers of Contemporary Commercial Music on the use of the middle voice. The data collected in the questionnaires showed a gap between the

participants' acknowledgement of the significance of mix register and yet illustrated that the participants actually had very little knowledge of the mix register.

An emerging topic from this data was that the listening experiences from these participants were much less significant than the listening experiences from Study One. As the major demographic of Study One were secondary and tertiary students, the researcher speculated that professionals nurtured listening experiences to a much greater extent than the student cohort. This emerging theme was tested in Study Three.

Throughout the process of Study One, the researcher was considering the correlation between personality and vocal identity. Therefore, some of the questions were leading towards seeking out a vocal identity. On the advice of her supervisor, the researcher decided that vocal identity was too broad for this project, so not all the data from the interviews could be used.

Study Two: Three Professional Singers

All three professional singers were able to identify their preferred register in the interview: one commented that she preferred chest mix register and two claimed that they preferred head mix register. (Subject A used the terms head, chest, mix, head mix and chest mix. Subject B used the terms chest and head only, Subject C used the terms chest, head, mix, head mix and chest mix.)

However, in one case the researcher's assessment of register use did not correspond with the singer's stated register preference. Subject B and Subject C identified a preference for head mix register and mix register respectively. But Subject A's stated preference for head mix register was not matched by her singing: she tended to use chest mix register.

The researcher had selected these three singers with the intention that they would provide an example of the three registrations: mix register, head mix, and chest mix. The process of selection was carried out by the researcher, who attended live performances for all three, and listened to recordings of their performances. The judgement as to register preference was made before the interviews took place. During the interview process with Subject A, it came to light that the researcher had identified a different preference than the singer felt she was singing in. This affected

the research in the respect that there was not a singer who preferred to sing in chest mix dominance.

Although the three professional singers stated a preference, they emphasized the importance of each register, especially when describing their register use during warm-up routines. Each singer specified that she would warm up the entire voice, including her non-preferred register, for overall vocal health and maintenance. Subject B discussed the need to warm up her chest mix register in order to enrich her head mix register. She explained that she suffered a vocal problem if she ignored the chest mix register. Subject B found that her entire range was diminished if she did not warm up her chest mix register efficiently. Therefore, even though she chose not to make excessive use of chest mix register in performance, she appreciated and understood its value.

Subject A also stated a preference for head mix, but habitually made use of chest mix in her warm-up routine. During the interview Subject A demonstrated vocal sounds that included pulse register and glottal stop attacks. She said that she did not use these sounds in performance, but found them beneficial in her warm up routine, specifically in order to achieve the use of her full range and for clarity of onset of sound.

Subject C also stated that she exercised her entire vocal range in her warm-up routine. In contrast with Subjects A and B, Subject C began her warm-up routine in the middle of her range and then worked down to the lowest notes before working up to her highest notes. Once she had performed the initial stage of her warm-up routine in this manner, she would continue to warm up her voice from the bottom of her range through to the top.

All three professional singers were able to articulate in great detail the types of exercises that they used for their entire range, including working through the non-preferred register. It was clear that although each singer had a preferred register, they all continued to work on and develop their full vocal range since they understood the importance of the maintenance of entire compass of their voice. This practice is well supported in the literature on vocal health (McCoy, 2012).

Further to the specific question about their warm-up routine, the three singers talked about their registers to varying degrees. As mentioned above, Subject B

favoured her head mix register but emphasized her chest mix register more often in the interview. Subject C was the only professional singer who identified chest mix as her preferred register. Similarly to Subject A, Subject C had experienced vocal health issues; however, this did not alter her register preference. Subject C did not mention her head mix register in the interview apart from her warm-up routine.

Subject A claimed to favour head mix register and she discussed this register more than chest mix in the interview. This discussion focused on the lack of skill she had in the past when performing in head mix compared with the skill she now possesses. From this, the researcher inferred that Subject A's perception of skill as a singer was hinged on the idea that the use of head mix was more skilful than chest mix. The researcher further inferred from the data that Subject A made this assumption because of the vocal health issues that she experienced when she sang in her chest mix register. The researcher thought it would be a reasonable assumption to link training experience to Subject A's preference for head mix over chest mix. The researcher's observation of a lack of training experience contributes to research question two: "To what extent have training, listening and performance experiences affected this performance?"

Subject A elaborated on her experience of singing in her head mix register before this part of her voice was developed and the restrictions this had placed on her in performance. This negative performance experience is pertinent to research question two, which addresses performance experiences. Subject A gave an example of a negative performance experience: "You know the awkward and embarrassing switch and then losing power and not being able to sing very high and feeling breathless." So it would seem that Subject A's experiences in training and performance have affected her preference for head mix, and her contention that head mix is more skilful.

In the data from interviews with Subject B and Subject C there was an emergent subtopic of listening experiences: each singer expressed that she liked to listen to and appreciated singers who performed in other registers. Although Subject A talked about her listening experiences to a much lesser extent than Subject B or C, she also expressed an appreciation for singers who sang outside her preferred register. A typical example of appreciation that was observed in the professional singers' interviews follows: "I was really inspired by [Subject B] when she came to

WAAPA last year. And I just love that pure, I'm really going towards loving that really pure tone again."

Similarly Subject B, who self-identified as a soprano, and stated a preference for head mix, still appreciated listening to other registers. In her discussion of teaching, Subject B stated:

> I'm more interested in stripping back the things in their sound that are not them. Um, so some of my students have quite naturally, like some of their speaking voices are quite throaty and so when they sing, it's kind of understandable that that's in there and it, if it doesn't hurt them to sing like that then that's kind of their sound, and again, it's what they do with that sound and it can be really quite beautiful.

Subject A also showed an appreciation for chest mix in performance, even though her preferred registration was self-identified as head mix:

> I had a young student come in yesterday. I have taught her for years and years. She's got her scholarship and went off to high school and she's with a really great teacher now and she came in, and was, yesterday and I hadn't seen her for six months and she was singing really great, but like high/chesty mix and I felt really jealous 'cause I thought I just felt like, aw, I do have room to, I really need to improve in that area, I do avoid my chest voice like the plague now.

Each of the professional singers had very strong ideas about her aesthetic preferences and her vocal strengths and weaknesses and these were articulated in greatest detail when discussing their vocal warm-up routines. It was most apparent here that they had an intimate knowledge of their voice and how they used it. The singers were able to recount particular exercises and how these applied to each register of the voice.

It would seem from these data that training experiences had a great influence on the professional singers, including register preference, because each singer used her voice to optimise vocal health and showed a desire to develop her overall vocal range. Each professional singer allowed her register preference to inform her performance choices, but not her vocal warm-up routines and the general care of her voice.

All three singers discussed vocal comfort at length. This could possibly be because of the performance demands that are placed on the professional singer, and

the belief that if singing becomes uncomfortable then this is a sign that there may be a fault (Edwards, 2002). When questioned, each singer was able to identify early signs of vocal fatigue, and to discuss ways to care for her voice in order to preserve her vocal health. The topic of vocal health is outside the parameters of this study, but it did present as a factor for Subject A when discussing register preference.

Limitations

The first foreseeable limitation of Study Two is that only three singers were used. Sampling a small population could result in a bias resulting from similarity of style, because all of the singers were jazz and contemporary performers. Performers of musical theatre and folk may have different experiences due to the different performance conventions and demands of these genres. This limitation was addressed in Study Three of this project, when a broader demographic of singers was recruited.

The participants in this study were all trained in jazz before they crossed over into contemporary performance. This may have affected how the participants used their voices, as there can be stylistic differences between jazz singing and contemporary singing. This issue was addressed in Study Three by recruiting mostly participants who were trained in contemporary singing.

In addressing the limitations listed above, an IPA methodology does support smaller samples of participants. Smith and Osborn state, " the aim of the study is to say something in detail about the perceptions and understanding of this particular group rather than prematurely make more general claims" (Smith & Osborn, 2008, p. 53) IPA selection is not randomized and therefore not necessarily representative but is considered to be a sought out selection of a particular group.

The researcher acted as expert listener when it came to identifying the preferred registers of the three singers. As stated above, the researcher and Subject A disagreed about Subject A's register preference. One of the objectives of Study Two was to choose three singers who sang in different registers, such as chest mix, head mix, and a balance of chest and head. This objective could not be met because of this discrepancy. This limitation was taken into consideration when designing the final stage of the research and was the reason for recruiting five expert listeners.

Conclusion

Based on the comments of the professional singers, the researcher found that they relied more on their listening experiences than pre-professional singers, perhaps because they had mastered their technique to a level where they could appreciate other activities that could improve their singing. These professional singers may have developed their tonal idea through their critical listening and this may have informed their vocal production. The professional singers were able to articulate their preferred register and discuss the contributing factors relating to this preference in terms of their listening experiences and training experience.

However, their register preferences did not limit their listening preferences, and they were able to discuss and praise singers who sang in their non-preferred register. This observation suggested that register preference was a personal vocal choice and not one that necessarily extended to listening preferences. In addition, despite articulating a register preference, each singer was able to discuss in detail her warm-up routine, which included attention to each register of the voice.

The researcher felt that these professional singers set a clear example of the way in which their register preference may inform their performance and influence their regular warm-up routines in order to maintain overall health and optimum vocal expression. This finding could be very useful for the student and the teacher: whereas there may be a register preference, the singer's entire vocal range must be developed and maintained for optimal creative expression.

Study Three: Analysis of Recorded Performances

The researcher's major focus of this final study was to address research question three: "Can these [singers'] preferences be traced in recorded performances?" This final study also gave the researcher an opportunity to address the limitations that had arisen from the comparative analysis of the first two studies. Finally, by triangulating the results of the three studies, the researcher could draw some conclusions about the main topic of the thesis.

The results of Study Three confirmed that register preferences could be traced in performance, but also revealed that there are factors influencing how

accurately this can be traced. Training experience did seem to impact on a singer's ability to communicate their performance experiences and understanding of register use. It would seem from the data that the higher the degree of training the singer had completed, the greater the concurrence between the performer and listening expert. Performance experiences also affected the degree to which the singer felt she could successfully express herself. Listening experiences also seemed to affect register preference.

The limitations of Study Two (Three Professional Singers) was corrected in the design of Study Three with the inclusion of five listening experts. The researcher chose to recruit an odd number of listening experts so that it would be possible to arrive at a majority opinion for each of the questions asked in the survey.

The limitation from One (Questionnaires) was addressed in the design of Study Three by recruiting an even demographic of three secondary students, three tertiary students, and three professional singers. Having an equal number of participants from these three levels of expertise allowed the researcher the opportunity to trace particular behaviours that might be present in one group of singers and not in another. Testing the listening experiences of secondary students and tertiary students against the listening experiences of professional singers was of particular interest to the researcher. The hypothesis that professional singers paid greater attention to listening experiences than secondary and tertiary students could be tested again in Study Three.

From the listening experts' answers, it was determined that the singers' vocal preference could be traced in performance. Register preference totals taken from this analysis offered the following results:

- Four participants preferred chest mix.

- Three participants preferred mix.

- One participant preferred head mix.

- One participant stated that she did not have a register preference.

Thus eight out of the nine participants' stated that they did have a preference for using either chest mix or head mix in their middle register. The most common preference was chest mix register.

From the examination of the data, it was evident that the three professional singers and the panel of experts agreed more than the other two cohorts. The secondary students corresponded less with the panel of experts along with one tertiary student. This is noteworthy because this particular tertiary student was undertaking a Certificate IV qualification, whereas the other two tertiary students were undertaking a Bachelor degree. It seems from this result that the more highly trained singers communicated more effectively their vocal preferences in performance; therefore their preferences could be more successfully traced in their performances.

Limitations

Initially five expert listeners were recruited, however, one expert listener failed to complete the survey so there was a total of only four expert listeners. This did not allow for a majority vote on every question. It would have served the research better had there been a majority vote for every question.

Summary

It is generally believed that a singer's register preference can be traced in performance. However, this research project has shown that there are factors that influence how well the register preference can be traced. The greatest factor that appeared to influence the agreement between the singer and the panel of expert listeners was the participant's training: the greater the level of training, the better the participants were able to identify their register accurately.

The relationship between training and register preference was further supported by the results of Study One (Questionnaires), which showed that training experience affected how articulately a singer was able to describe their performance. The singer was more expressive about their use of middle register when they had received a higher level of training.

The Study Three participants' vocal influences in the questionnaire were compared with the vocal styles that the panel of experts could detect in the singers' performances. The experts were able to detect almost all of the performers' vocal influences. However, there were two occasions in which the panel of experts

detected Classical styles in two professional singers' performances, that is Participant Three and Participant Six, when these were not regarded as listening or training experiences by these professional singers.

The listening experiences of the secondary students ranged from one genre to three genres. In contrast, the listening experiences of the tertiary students ranged from two genres to more than four, as was the case for Participant Four. The listening experiences of the professional singers ranged from two genres to more than four, as was the case for Participant Six. Therefore, the range of listening experiences was the narrowest in the secondary students and the broadest in the professional singers. This was an emerging topic that showed up in the analyses of Study One and Study Two, and was confirmed in the analysis of Study Three.

Emerging Topics

The data from each study suggested that singers do have a preference for using either chest mix or head mix in their middle range. This preference was present in both pre-professional and professional singers. Although there was a preference for using chest mix among the nine singers in Study Three, the collective data showed that it could not be claimed that CCM singers preferred chest mix register or head mix register. The distribution of register preference amongst the singers for each stage of the project is outlined below:

Study One: Twenty-two participants stated a preference for singing in chest mix registration. Twenty participants stated a preference for singing in a balanced mix. Eleven participants stated a preference for singing in head mix registration. Three participants did not state a preference.

Study Two: Two professional singers favoured head mix and one professional singer favoured chest mix.

Study Three: One singer explained that she did not have a register preference, one singer favoured head mix, one singer explained that she favoured the middle register, and six singers favoured chest mix.

Training did seem to affect the performers' preference for using chest mix or head mix in their middle register. This was reflected in the singers' ability to communicate their performance experience, which was apparent in the data

collection from Studies One and Three of this project. Therefore, it could be inferred that the more training the singer had undertaken the more articulate they were in explaining their use of registration. Further to this, the register preference could be more accurately traced in performance.

Performance experiences seemed to affect the preference for using chest mix or head mix. This was reflected in the data collected from each study, especially when the participants discussed intensity and expression. Participants favoured the register in which they were able to gain greater intensity and expression in their voice, and conversely participants expressed dissatisfaction regarding the register in which they were not able to achieve a suitable level of intensity or expression. It was also evident from the data that negative performance experiences served to discourage the singer from using a particular register. This was particularly evident in Subject A's interview.

Listening experiences did seem to affect the performers' preference for using chest mix or head mix in their middle register. This was inferred from the first two studies. The emergent topic in Study Two, in which three professional singers were interviewed, was the broad range of listening experiences articulated by each singer. These listening experiences were not bounded by the singers' register preference; furthermore, each singer was able to appreciate listening experiences that were outside her register preference. It could be further implied that listening experiences can inform the singer's register preference.

Participants from each study of this project often spoke about the technical difficulties of singing. This suggests that degree of difficulty is an important consideration for the singers. It would seem that the level of difficulty was reduced when the level of training was increased.

This was exemplified in Study Two, when Subjects A and C spoke of the difficulties they experienced early in their singing careers, which eventually resulted in vocal problems. These problems were solved with continued training. One of the most widely discussed criteria from Study One (Questionnaires) was degree of difficulty, with 47 percent of the participants discussing ease or difficulty of singing. The demographics of this study were mostly secondary and tertiary students. It would seem that the students' skill level was still developing and the professional

singers from Study Two had less difficulty because their skill level was more developed.

In Study Three, only one of the nine singers was judged unanimously by the four listening experts as not having chosen a suitable key to perform the song in. The researcher interpreted this observation by the listeners as detecting vocal difficulties within the performance. Significantly this participant was a secondary student and therefore would have had less training than most of the other participants.

These results address research question two: "To what extent have training, listening and performance experiences affected their preference?" The results of the data collected from Studies One and Two of this project seem to suggest that training has the greatest impact on the singer's preference for chest mix or head mix registration.

Participants in Study One and Study Two talked frequently about aesthetic preference in discussions of the sound they made when singing in their favored register. It may be implied from this association between aesthetic preference and register preference that these two variables are linked. However, listening experiences amongst the professional singers were not limited to listening to singers who performed in their favoured register.

This final study allowed the researcher to test the emerging propositions and, as a consequence, to yield more rigorous results. The emergent proposition about listening experiences could be tested to see if there was a difference between the experiences of secondary, tertiary and professional singers. The Study Three data added weight to the proposition that the professional singers had the broadest range and the secondary students had the narrowest range. From this data collection it would seem that listening experiences do affect singers' register preferences. It could be inferred that broader listening experiences inform the performance choices of the performer to accept and appreciate sounds outside of their preferred register. The researcher infers from this analysis that listening experiences can liberate the singer and inform their performance choices.

As the research for this thesis progressed, the parameters narrowed greatly from registration in terms of five separate stages of pulse, chest, mix, head and whistle to observing the middle-range exclusively and further defining this into mix,

chest mix and head mix. This was an unexpected result of the research process. The ability to narrow the focus from initially looking at the whole range of the female voice to addressing the middle register served to gain more specific information regarding female register preferences. Narrowing the range of the voice to the middle range also enabled the researcher to address the specific activity that was occurring in the larynx and how the singer was dealing with this. This allowed factors such as range and voice type (i.e. soprano, mezzo-soprano and alto) to be excluded so that the data collected could be particular to the singers' middle register, regardless of voice type or range.

Teaching Experiences

Throughout the research, the researcher continued to teach in both a high school and a private studio environment. This was advantageous to the researcher because ideas from the emerging research could be explored in the studio. The knowledge that there was possibly a preference of either head mix or chest mix allowed the researcher as teacher to navigate through the entire range. The researcher was able to encourage students to stop avoiding the parts of their voice they did not prefer and to continue to work in that area as a way of strengthening their preferred register. There was no need for each student to be informed of her register preference, as this was a topic that remained under investigation; however, the teacher's newfound ability to subtly navigate through the range, to reassure the student on the sounds being made and to provide constant encouragement were of assistance to the student.

Clarification of when the students were singing in particular mixtures allowed the students greater understanding of their voice. For example, in a major scale warm-up, as the student was transitioning from pure head register of G5 down to a mix register of G4, a confirmation around a B4 of "Now you are in head mix register" was given to the student and this appeared to enlighten the student as to when and how they were transitioning. This also opened up further discussion between the teacher and students about physical sensations and preconceived ideas that students may have imposed on themselves regarding the limits of their range.

According to the data, listening experiences can make an impact on the singer by allowing them to accept sounds that are made outside of their preferred register and to confirm the sounds that they would like to make as a singer. Listening

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experiences can also assist the singer in understanding the qualities of the middle register and how these can be different in mix, chest mix and head mix. The researcher as teacher had not previously taken this into account. Within the studio, the relationship between teacher and student was mostly about the student's own sound but included listening experiences in the lesson time that could be of benefit to the student. The suggestion of positive reinforcement of listening is a habit that the teacher could develop with the student. The evidence in the data collected from this project could be used to encourage greater listening activity in the voice studio. By exposing students to various types of register dominant performances, followed by discussion, the teacher can encourage students to explore these performances further in their own listening time.

In terms of teaching CCM, it has been extremely valuable for both teacher and students to keep in mind that belt and chest mix registration and contemporary speech-like singing all developed in CCM at the same time. This is in contrast with legit singing and the use of head mix registration, and the ubiquitous nature of this style before amplification. The historical and parallel developments of amplification and CCM have demonstrated that use of the microphone in the voice studio is extremely important for the student. Anecdotal evidence would suggest that the microphone is possibly not used enough in the voice studio and further research could be undertaken to explore the use of the microphone in the Contemporary Commercial Music voice studio.

Future Research

During the beginning stages of this project, the researcher was seeking to draw out possible links between register preference and personality types. As the project developed, it became apparent that personality type was a subject matter that was beyond the scope of a Master's degree. However, a possible link between personality type and register preference remains a topic that could be explored in future investigations.

Another area of voice research that would benefit from further exploration is the historical development of belt and legit vocal styles in CCM. This would include a more in-depth exploration into the origins of the belt and legit styles, including looking further back in history to the use of belt sound before vaudeville and to the

use of legit sound before its appearance in operetta. The information gathered in this project regarding the origins of these two singing styles proved to be of great assistance to the researcher as teacher.

As discussed in the literature review, the register that is said to be used for the style of legit singing is head mix and the register that is said to be used for belt style is chest mix (Balog, 2005). It has been enlightening to give a brief explanation of these origins at opportune times to the student, including students having difficulty working in a particular area of the voice that was not their preferred register. In fact the discoveries that were made between the researcher-as-teacher and the student were so positive that it was felt to be the most significant aspect of the research.

Overall, the results of this project suggest the following:

- The participants in each of these studies expressed a preference for using either chest mix or head mix in their middle register.

- The level of training undertaken may affect a pre-professional and professional singer's preference by enabling the performers to understand how to navigate through their middle voice and gain the required technique to assertively use their preferred register.

- Performance experience may affect the singers' register preference in a positive or negative way. Negative performance experiences in a particular mix can discourage the singer from having a preference for this register. Conversely, positive performance experiences in a particular mix can encourage the singer to have a preference for this.

- Listening experiences may encourage the singer to understand the use of mix register when applied to either chest mix or head mix. The performer might gain an appreciation for the application of either register by listening to other singers in professional recordings and live performances.

- It does appear that overall there is still some confusion surrounding the middle register of the female voice and its application in CCM; therefore further research in this register would be valuable to the increasing popularity of CCM music and its demands in the voice studio.

REFERENCES

Auslander, P. (2004). Performance Analysis and Popular Music: A Manifesto. *Contemporary Theatre Review, 14*(1), 1-13. doi:10.1080/1026716032000128674

Balog. (2005). Popular Song and Music Theater: A Guide to Evaluating Music Theater Singing for the Classical Teacher. *Journal of Singing - The Official Journal of the National Association of Teachers of Singing, 61*(4), 401-406.

Balog, J. E. (2005). A Guide to Evaluating Music Theatre Singing for the Classical Teacher. *Journal of Singing, 61:4*, 401-406.

Bartlett, I. (2010). One Size Doesn't Fit All: Tailored Training for Contemporary Commercial Singers. In D. S. Harrison (Ed.), *Perspectives on Teaching Singing* (pp. 227-244). Australia: Australian Academic Press.

Bestebreurtje, M. E. (2000). Resonance Strategies for the Belting Style: Results of a Single Female Subject Study. *Journal of Voice - Official Journal of the Voice Foundation, 14*(2), 194-204. doi:10.1016/S0892-1997(00)80027-2

Bourne, T., Garnier, M., & Kenny, D. (2011). Music Theatre Voice: Production, Physiology and Pedagogy. *Journal of Singing, 67*(4), 437-444.

Boyce-Tillman, J. (1999). Hildegard of Bingen: A Woman for our Time. *Feminist Theology, 8*(22), 25-41. doi:10.1177/096673509900002203

Castellengo, M., Chuberre, B., & Henrich, N. (2003). Modern research in experimental phoniatics. *Folia Phoniatrica et Logopaedica, 14*(2-3), 81-149.

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), 636-649. doi:10.2307/3345428

Christian, T. H., & Jan, G. S. (2014). Adjustment of Glottal Configurations in Singing. *Journal of Singing, 70*(3), 301.

Citron, S. (2002). *A complete guide to the craft of song writing.*

Courlander, H. (1963). *Negro Folk Music, U.S.A.* United States of America: Columbia University Press.

Delp, R. (2001). Now that the Belt Voice Has Become Legitimate. *Journal of Singing - The Official Journal of the National Association of Teachers of Singing, 57*(5), 1-2.

Denscombe, M. (2003). *The Good Research Guide* (Second Edition ed.). Philadelphia USA: Open University Press.

Dormon, J. H. (1988). Shaping the Popular Image of Post-Reconstruction American Blacks: The "Coon Song" Phenomenon of the Gilded Age. *American Quaterly, 4*(40), 450-471.

Doscher, B. (1994). *The Functional Unity of the Singing Voice* (2nd Edition ed.). London: The Scarecrow Press, Inc. Lanham, Md., & London.

Edwards, D. (2002). BELTING the Healthy Way. *Canadian Music Educator, 44*(2), 34-34.

Edwin, R. (2003). A Broader Broadway. *Journal of Singing, 5*(59), 431-432.

Edwin, R. (2004). Popular Song and Music Theater: "Belt Yourself". *Journal of Singing - The Official Journal of the National Association of Teachers of Singing, 60*(3), 285-288.

Edwin, R. (2007). Belt Is Legit. *Journal of Singing, 64*(2), 213.

Edwin, R. (2009). Popular Song and Music Theater: What's Going on on Broadway? *Journal of Singing - The Official Journal of the National Association of Teachers of Singing, 66*(1), 71-73.

Edwin, R. (2014). Vocal Parenting Revisited. *Journal of Singing, 70*(3), 341.

Ekholm, E. (1998). Relating Objective Measurements to Expert Evaluation of Voice Quality in Western Classical Singing: Critical Perceptual Parameters. *Journal of Voice - Official Journal of the Voice Foundation, 12*(2), 182-196.

Fernald, A. (1985). Four-month-old infants prefer to listen to motherese. *Infant Behavior and Development, 8*(2), 181-195. doi:10.1016/S0163-6383(85)80005-9

Foster, D. H. (2005). From Minstrel Shows to Radio Shows: Racism and Representation in Blackface and Blackvoice. *The Journal of American Drama and Theatre, 17.2*(2), 7-16.

Fung, C. V. (1994). Undergraduate Nonmusic Majors' World Music Preference and Multicultural Attitudes. *Journal of Research in Music Education, 42*(1), 45-57. doi:10.2307/3345336

Gall, J. P., Borg, W. R., & Gall, M. D. (2005). *Applying educational research: a practical guide* (Vol. 5th). Boston: Pearson/Allyn & Bacon.

Garcia, M. (1984). *A Complete Treatise on the Art of Singing: Part One*. New York: Da Capo Press.

Grant, M. N. (2004). *The Rise and Fall of the Broadway Musical*. United States of America: Northeastern University Press.

Hall, K. (2007). Popular Song and Music Theater - Music Theater and Classical Singing: At Odds Personally and Professionally. *Journal of Singing - The Official Journal of the National Association of Teachers of Singing, 63*(5), 569-572.

Hall, K., & LoVetri, J. (2013). The necessity of using functional training in the independent studio. *Journal of Singing, 70*(1), 79.

Henrich, D. N. (2006). Mirroring the voice from Garcia to the present day: Some insights into singing voice registers. *Logopedics Phonatrics Vocology, 31*(1), 3-14. doi:10.1080/14015430500344844

Herbst, C., & Svec, J. (2014). Adjustment of glottal configurations in singing. *Journal of Singing, 70*(3), 301-308.

Hollien, H. (1974). On vocal registers. *Journal of Phonetics, 2*, 125-143.

Hollien, H. (1983). *Report on vocal registers*. Paper presented at the Stockholm Musical Accoustic Conference, Stockholm Royal Swedish Academy of Music.

Jander, O., Harris, E. T., Fallows, D., & Potter, J. (2001). Singing: Oxford University Press.

Jennings, C. A. (2014). *Belting is beautiful: Welcoming the musical theater singer into the classical voice studio.* (Dissertation/Thesis), ProQuest, UMI Dissertations Publishing. Retrieved from http://ecu.summon.serialssolutions.com/2.0.0/link/0/eLvHCXMwnV3bTsMw DLVge0E8cL-D_AMTbZqpjBcQl8EHICHxMpXUkSqFBraV78dOm2kI7YW3tqlaS3GdY-f0GAB1UuoRW2iTpFCMF9iFTZ5Y0TYzxZDSBRGzFYq-jWWBdmpjRAxhuvRGKuSXIuuuRDcku_n8GkjPKNlb7RporENfFn7x6adl8 LPI1TnjSpXowAw7kad4rv5E4LCsjLcg8tginaRjE8Zfc37JNf7b8G3YfFjadd-BNap3oR86PO_B2x05oT5jNcN3KtgPbeOu8ZUcv0CuM0LEjyZMphwzNp 3iLBQDsarnPowbweDhjm_PkQdFtLby-3Axfny5fx5Emyelc5NMc_KQM-

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MMfWUZ2lKvyGA5XPORk5cgpbDDu0G0l4wx682lD56Fb1A-5Oahu

Kazi, A. M., & Khalid, W. (2012). Questionnaire designing and validation. *JPMA. The Journal of the Pakistan Medical Association, 62*(5), 514.

Lebowitz, A., & Baken, R. J. (2011). Correlates of the Belt Voice: A Broader Examination. *Journal of Voice, 25*(2), 159-165. doi:10.1016/j.jvoice.2009.10.014

Lisa, P. (2007). The Multiplicity of Belting. *Journal of Singing, 64*(1), 77.

Lovetri, J. (2002). Contemporary commercial music: More than one way to use the vocal tract. *Journal of Singing, 58*(3), 249-252.

LoVetri, J. (2008). Editorial: Contemporary Commercial Music. *Journal of Voice - Official Journal of the Voice Foundation, 22*(3), 260-262.

Lovetri, J. (2013). The Confusion About Belting: A Personal Observation. *VoicePrints, Journal of the New York Teachers' Association, 10*, 4-7.

McCoy, S. (2004). *Your Voice: An Inside View*. United States of America

Princeton, NJ: Inside View Press.

McCoy, S. (2007). Voice Pedagogy: A Classical Pedagogue Explores Belting. *Journal of Singing - The Official Journal of the National Association of Teachers of Singing, 63*(5), 545-549.

McCoy, S. (2012). Some thoughts on singing and science. *Journal of Singing, 68*(5), 527.

McCoy, S. (2012). *Your voice: an inside view* (Vol. Second). Delaware, Ohio: Inside View Press.

McCoy, S. J. (2012). *Your voice: an inside view* (Vol. Second). Delaware, Ohio: Inside View Press.

Miller, D., & Schutter, H. (1994). Toward a definition of male 'head' register, passaggio, and 'cover' in western operatice singing. *Folia Phoniatrica et Logopaedica, 46*(4), 157-170.

Miller, D. G., & Schutte, H. K. (2005). 'Mixing' the Registers: Glottal Source or Vocal Tract? *Folia Phoniatrica et Logopaedica, 57*(5-6), 278-291. doi:10.1159/000087081

Miller, R. (1986). *The structure of singing: system and art in vocal technique*. New York;London;: Schirmer Books.

Miller, R. (1993). *Training Tenor Voices*. New York: Schirmer Books.

Olsen, W. (2012). *Data collection: key debates and methods in social research*. Thousand Oaks, CA: SAGE Publications.

Osborne, C. L. (1979a). The Broadway Voice: Part 1. *Just Singin' in the Pain, 29*, 57-65.

Osborne, C. L. (1979b). The Broadway Voice: Part 2. *High Fidelity, 29*, 53-56.

Piernay, R. (2007). Some thoughts on tonal image. *Journal of Singing, 63*(4), 425-430.

Popeil, L. (2007). The Multiplicity of Belting. *Journal of Singing, 64*(1), 77 - 80.

Ralston, J. (1999). The Development of an Instrument to Grade the Difficulty of Vocal Solo Repertoire. *Journal of Research in Music Education, Volum 47*(2), 163-173.

Robinson-Martin, T. (2009). Performance Styles and Musical Characteristics of Black Gospel Music. *Journal of Singing, 65*(5), 595.

Robinson, D. K. (2014). TV Talent Shows: Navigating the Minefield. *Journal of Singing, 70*(5), 585.

Roubeau, B., Chevrie-Muller, C., & Arabia, C. (1991). *Control of laryngeal vibration in register change* (G. J & H. B Eds.). USA: Singular Publishing Group.

Roubeau, B., Henrich, N., & Castellengo, M. (2009). Laryngeal Vibratory Mechanisms: The Notion of Vocal Register Revisited. *Journal of Voice, 23*(4), 425-438. doi:10.1016/j.jvoice.2007.10.014

Saladana, J. (2013). *The Coding Manual for Qualitative Researchers* (J. Seaman Ed. Second Edition ed.). Los Angeles, London, New Delhi, Singapore, Washington D.C.: Sage.

Schutte, H. K., & Miller, D. G. (1993). Belting and Pop, Nonclassical Approaches to the Female Middle Voice: Some Preliminary Conclusions. *Journal of Voice, 7*(2), pp, 142-150.

Schwandt, T. A. (2001). *Dictionary of qualitative inquiry* (Vol. 2nd). Thousand Oaks, Calif: Sage Publications.

Silverman, D. (2000). *Doing qualitative research: a practical handbook*. Thousand Oaks, Calif;London;: Sage Publications.

Singing High Voice Fourth Grade. (2010). Melbourne, Australia: Australian Music Examinations Board.

Smith, J. A., & Osborn, M. (2008). Interpretative Phenomenological Analysis *Qualitative psychology: a practical guide to research methods* (2nd ed. ed.). Los, Angeles, CA: SAGE Publications.

Thurman, L., Welch, G., Centre for Advanced Studies in Music, E., VoiceCare, N., Fairview Arts Medicine Center . Voice Center of, F., National Center for, V., . . . Speech. (2000). *Bodymind & voice: foundations of voice education*. Minneapolis, Minn: VoiceCare Network.

Titze, I. R. (1988). A framework for the study of vocal registers. *Journal of Voice, 2*(3), 183-194. doi:10.1016/S0892-1997(88)80075-4

Titze, I. R. (2008). Voice Research and Technology: Quantifying Tessitura in a Song. *Journal of Singing - The Official Journal of the National Association of Teachers of Singing, 65*(1), 59-61.

Ware, C. (1998). *Basics of Vocal Pedagogy: The Foundations and Process of Singing*. United States of America: The McGraw-Hill Companies.

Williams-Jones, P. (1975). Afro-American Gospel Music: A Crystallization of the Black Aesthetic. *Ethnomusicology, 19*(3), 373-385. doi:10.2307/850791

APPENDICES

Appendix 1: Comparison Table for Subject B

Nodes	Number of coding references
Aesthetic Preference Pleasing	3
Aesthetic preferences - non pleasing	0
Authentic	5
Comfort	4
Compass	4
Degree of difficulty - ease	0
Intensity	0
Judgement	0
Laryngeal Tilt speech like	0
Listening	1
Listening experiences	22
Lower register	5
Phonation	2
Production	1
Range - High or Low	0
Range High	0
Range Low	0
Registration ease of transitioning	3
Resonant - Resonant	0
Skill	2
Style	0
Stylistic	3
Stylistic Expressive Emotional Flexibility	6
Support - more required	0
Timbre	6
Training	3
Upper register	2
Vocal Identity	4

Appendix 2: Excerpt from Listening Analysis

Aspects of Voice Prod (Variables)	Continuum (Criteria)	Notes0	Candidate1	Notes1
Degree of Difficulty	Ease / Lack of Ease		1A	"A singer who excites me is one who can blend between the head and chest registers seamlessly and therefore the singing appears effortless."
Timbre	Bright / Dark	Descriptors such as deeper and darker are interpreted as dark. Dark is also correlated with richness and fullness		
Range	Small (narrow) / Large (broad)			
Tessitura	Comfort / Discomfort			
Registration	Ease of Transition / Difficulty of Transition		1I	"These singers who can achieve that seamless cross over the register change are interesting and have greater depth to their work."
Skill	Competent / Incompetent		1K	These singers who can achieve that seamless cross over the register change are interesting and have greater depth to their work.

Resonance	Unresonant / Resonant			
Sustainability	Sustainable / Unsustainable			
Understanding	Confusion / Clarity			
			45U	"Powerful and moving."
Stylistic/Expressive/Emotional	Flexible / Inflexible Flexibility			

Appendix 3: Example of Coding for Questionnaires

	1. What is your age	2. Is English your first language	3. If no, which language is your first	4. Which register do you naturally sing in	5a. What are your opinions about chest	5b. What are your opinions about mix	5c. What are your opinions about head
30	11		n.a.	Mix	n.a.	because it is easy	n.a.
34	11	Yes	n.a.	Mix	n.a.	You can sing what way you want to .	n.a.
37	12	Yes	n.a.	Mix	You get a lot more power in your voice	Your range would be a lot bigger	You are able to hit higher notes
13	13	Yes	n.a.	Chest/Mix	I like singing chest because I like the way it feels	I like singing mix because it is not too high or to low	I don't like singing head cause I feel its to high for me

Appendix 4: Excerpt from Listening Analysis

Aspects of Voice Prod (Variables)	Continuum (Criteria)	Notes0	Candidate1	Notes1
Degree of Difficulty	Ease / Lack of Ease		1A	"A singer who excites me is one who can blend between the head and chest registers seamlessly and therefore the singing appears effortless."
Timbre	Bright / Dark	Descriptors such as deeper and darker are interpreted as dark. Dark is also correlated with richness and fullness		
Range	Small (narrow) / Large (broad)			
Tessitura	Comfort / Discomfort			
Registration	Ease of Transition / Difficulty of Transition		1I	"These singers who can achieve that seamless cross over the register change are interesting and have greater depth to their work."
Skill	Competent / Incompetent		1K	These singers who can achieve that seamless cross over the register change are interesting and have greater depth to their work.

Resonance	Unresonant / Resonant			
Sustainability	Sustainable / Unsustainable			
Understanding	Confusion / Clarity			
			45U	"Powerful and moving."
Stylistic/Expressive/Emotional	Flexible / Flexibility Inflexible			

Appendix 5: Ralston Repertoire Difficulty Index

THE RALSTON REPERTOIRE DIFFICULTY INDEX (RRDI)

RANGE

Easy	Range is limited to a major tenth.
Moderate	Range is up to one octave plus a fifth with moderate register changes.
Difficult	Range is extended to two octaves and beyond with difficult register changes.

TESSITURA

Easy	Tessitura lies well within the comfortable range for high soprano.
Moderate	Tessitura is moderately high or low but reasonable for high soprano.
Difficult	Tessitura is high or low and may be difficult to sustain.

RHYTHM

Easy	Rhythm is uncomplicated and symmetrical.
Moderate	Rhythm has moderate complexity (alternating meters).
Difficult	Rhythm is complex (compound meters, alternating meters).

PHRASES

Easy	Phrases are short (2–3 measures).
Moderate	Phrases are up to 3–5 measures long.
Difficult	Phrases are long and require strong breath control.

MELODIC LINE

Easy	Melodic line is simple, diatonic with conjunct intervals and is syllabic.
Moderate	Melodic line may include disjunct and difficult intervals and may include melismas.
Difficult	Melodic line is chromatic with leaps of more than an octave.

HARMONIC FOUNDATIONS

Easy	Harmonic foundations include triadic accompaniment with few dissonances.
Moderate	Harmonic foundations include consonant to moderately dissonant accompaniment that may or may not be related to the voice part.
Difficult	Harmonic foundations include dissonance and clear delineation between melody and accompaniment.

PRONUNCIATION

Easy	Pronunciation of consonants and vowels, individually or in combination, is relatively simple with regard to tempo, vocal placement, and repetition.
Moderate	Pronunciation of consonants and vowels, individually or in combination, is moderately complex with regard to tempo, vocal placement, and repetition.
Difficult	Pronunciation of consonants and vowels, individually or in combination, is difficult with regard to tempo, vocal placement, and repetition.

Figure 1. The Ralston Repertoire Difficulty Index.

Ralston, J. (1999). "The Development of an Instrument to Grade the Difficulty of Vocal Solo Repertoire." Journal of Research in Music Education **Volume 47**(2): 163-173.