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BI-PHONIC VOICE –

A STUDY OF THE POTENTIAL FOR USING THE EXTENDED VIBRATIONAL QUALITIES OF OVERTONE CHANTING AND SINGING AS AN INTERVENTION IN TRAINING THE SPEAKING VOICE.

Catherine Margaret Muller

Research report submitted in partial fulfilment of the requirements for the degree of Master of Arts by Coursework and research report

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Declaration

I, CATHERINE MARGARET MULLER, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Arts in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

CATHERINE MARGARET MULLER

Abstract

This study examines human vocal production through the lens of vibration. The needs of the speaking voice in terms of communication are explored, with particular emphasis on the vocal needs of the professional speaker, where extended range and resonance will ensure optimum communicative effect. As this goal may require training, a comparative study is presented of approaches to vocal training that have the aim of improving resonance and range while minimising damage to the vocal apparatus. These approaches include the quest to overcome physical, societal and emotional blocks to effective vocal production. This comparative study is based on the writings of a selection of popular vocal training theorists' writings.

To enhance the study of effective vocal production, the physical and physiological means of meeting the needs of producing voice are explored, by an interrogation of what vibration is in terms of vocal production. To investigate this, I have examined the physical nature of vibration, followed by the physiological aspect of this vibration as it relates to vocal production. Included in this investigation is an appreciation of what might affect the vibrations of speech that relate to resonance and range, to either enhance or hinder them.

Because Bi-phonic voice, or Overtone singing and chanting, uses extended vibrational qualities, this study explores the possibility of using these vibrational qualities in vocal training to extend range and resonance. A brief ethnological study of Bi-phonic voice is presented followed by an examination of its functioning with emphasis on the manner in which the vibrations used may differ from those in western vocal techniques. Experiential reports of Bi-phonic vocal production,

obtained through interviews, are presented, which in conjunction with literature on the practice will contribute to ascertaining whether there is in fact potential for using the techniques, without endangering the vocal apparatus, as an adjunct to current vocal training trends.

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Table of Contents

Declaration ii

Abstract iii

Acknowledgements v

Table of Contents vi

TABLE OF FIGURES vii

SECTION 1 BACKGROUND TO THE FIELD OF STUDY 1

Chapter 1 INTRODUCTION 1

Chapter 2 THE NEED FOR VOICE 6

Chapter 3 THE NEEDS OF PROFESSIONAL VOCAL PRODUCTION 9

3.1 Vocal Training 14

3.2 Overview of current vocal training techniques 16

Chapter 4 RESEARCH APPROACH 21

Chapter 5 LITERATURE SYNTHESIS 22

SECTION 2 PHYSICAL AND PHYSIOLOGICAL PROPERTIES OF VOCAL PRODUCTION 33

Chapter 6 VOICE AND VIBRATION 33

6.1 What is Vibration 34

6.2 What is vibration with regard to vocal production? 40

6.3 Phonation 41

6.4 Resonance 50

6.5 Hearing 60

SECTION 3 BI-PHONIC VOICE 63

Chapter 7 ABOUT BI-PHONIC VOICE 63

7.1 General overview 63

7.2 Background, history and development 63

7.3 Vocal production of throat singing 66

7.4 Different uses of vibration and vocal bands for different types of overtone chanting 72

Chapter 8 QUESTIONNAIRES AND INTERVIEWS ON BI-PHONIC VOCAL PRACTICE 75
8.1 Questionnaires and Interviews in detail 75
8.2 Interview Findings – Summary 89
8.3 Results and Discussion 97
Chapter 9 CONCLUSION 104
Chapter 10 THE WAY FORWARD 110
Bibliography 111
Appendix A 127

TABLE OF FIGURES

FIGURE 6.1 SINE CURVE, AFTER 'PASS MY EXAMS – GCSE SCIENCE- WAVES' USING LETTERING ADDED BY WRITER 35
FIGURE 6.2 A TRANSVERSE WAVE IMAGE FROM 'PASS MY EXAMS – GCSE PHYSICS 36
FIGURE 6.3 LONGITUDINAL WAVE FROM GCSE SCIENCE.COM 2-WAVES 37
FIGURE 6.4 CONTRAST BETWEEN (A) LONGITUDINAL AND (B) SINUSOIDAL WAVE. (HEWIT, 2006) 37
FIGURE 6.5 SINE CURVE SHOWING AMPLITUDE (TUTORVISTA.COM) 38
FIGURE 6.6 VIEWS OF THE LARYNX 41
FIGURE 6.7 SIDE VIEW OF THE LARYNX 42
FIGURE 6.8 IMAGE OF VOCAL CORDS FROM STANFORD SCHOOL OF MEDICINE –IMAGES-VOCAL CORDS 43
FIGURE 6.9 THE BASIC AREAS OF RESONANCE (OWN COMPOSITE AFTER COLSON, EISENSON.) 52

SECTION 1 *BACKGROUND TO THE FIELD OF STUDY*

Chapter 1 INTRODUCTION

The focus of this report is to examine human voice production through the lens of vibration. Particular emphasis is laid on the understanding and use of vibration in vocal training trends for spoken performance voice, and on extending this examination to an exploration of Bi-phonic voice, alternatively known as throat singing, or overtone singing and chanting. This exploration is conducted in order to assess the potential for using Bi-phonic voice, with its extended vibrational qualities, as an intervention that may contribute to praxis in both traditional and more modern vocal training, in the areas of improving resonance and range in the speaking voice for performance and of removing blocks to these aspects of voice production.

The human voice could be regarded as one of the wonders of the natural world both because of the infinite, almost miraculous complexity of its production, and because of its range of usage. There are many ways to define voice, with the Collins English dictionary alone giving 10 definitions as it pertains to human sound production. It is practical, however, for the purposes of this report, to summarise a number of definitions to say that 'voice' is the sound produced by the vibration of the vocal bands in the Larynx when excited by the breath. This sound, being amplified and modified through the changing shape of the pharyngeal and buccal cavities, gains in resonance and tone to give a distinctive sound that characterises a person's utterance through the mouth and gives it meaning. 'Voice' thus defined can be used for speaking or singing to express both facts and feelings or opinions, and it is 'how' the voice is used that can define how successful this expression is.

When Longfellow wrote, '*O, how wonderful is the human voice! It is indeed the organ of the soul!"* in his novel 'Hyperion,' in 1839, he expressed a thought that has resonated with such varied theorists of vocal training as Lessac, Wolfson, Hart, Wise and Joseph. He may have been expressing a general precept, but was writing in particular of a woman who spoke "in a voice so musical and full of soul, that it moved the soul… like a whisper from heaven" (1839). To express what is in the soul, is to express not only the factual content of the words but also what one is thinking and feeling at the moment, in fact, the entirety of the person, ' the deepest parts of ourselves ….class, background, education, perceived status in the world, fears, denials' (Rodenburg , 1992, px).

To accomplish this level of communication, the voice is capable of tremendous range of expression, comprising variations in pitch range, volume and resonance, depending on age, gender and the function of the use of the voice. It is these differences that can make the voice so infinitely expressive. The voice as used in normal, healthy, adult speech can have a pitch range of three to four octaves, but this full range is possibly only accessed when emotionally stimulated, for instance by anger, fear or excitement. For most people, in everyday speech the range is generally limited to a lesser range, possibly even only three to four notes (Rodenburg, 1998, p98) and this can affect communication. We all know that the teacher who drones on in a monotone tends to be boring and possibly sends his pupils to sleep. However, to speak with a voice that expresses what is in the soul can indeed move the souls of the listeners. Powerful rhetoric can stir nations, as has been shown by reactions to speakers such as Martin Luther King, Hitler and Churchill, and the reputed foreign actress who brought her English speaking audience to tears with the tragedy in her voice as she recited the alphabet of her

native language (Bynum, 2012). The difference between the boring teacher and those speakers who move their audiences arises in the expression of feeling or intent that is shown in the voice that can access the full range of feeling. Thus we see that extension of the vocal range can improve the capabilities of vocal communication, to the point where limitation of the range can affect the effectiveness of the communication, especially for the person who uses the voice professionally. For this reason any methods that explore the possibilities in this field are of great interest to those concerned with vocal communication, and sometimes those methods could be found in vocal practices of different cultures.

The practice of Tuvan, Mongolian and Tibetan Bi-phonic singing or chanting, alternatively called Overtone singing or chanting, or Throat Singing, incorporates a wide range of sounds, from a deep drone to high pitched flute-like sounds, sounds that are not usual in the 'normal' speaking voice discussed above. These sounds can occur simultaneously and in certain instances may be caused by using the vibrations of both the vocal bands and the false vocal bands to produce 2 or more harmonically related sounds at the same time (Sakakibara, 2002). A member of a well-known overtone singing group from Tuva, in the steppes of Siberia, likened this use of the voice to the visual image of the separate rays of sunlight often seen shining through clouds at sunset (Levin, 2006, p22). The overall effect is light, but the separate rays are clearly visible. In the same way the sound produced by overtone singing is all one aspect of the same sound, and yet separate sound elements are clearly audible. This visual image they call *xun xurtu* (meaning 'sun propeller' in Tuvan) and is so much part of the cultural singing ethos of that region that the group named themselves *Huun Huur Tu* after this metaphor for their voices (Levin, 2006, p22).

This Bi-phonic form of vocal usage has been a part of the Tuvan way of life for hundreds of years (Pegg, 1992,P39), as nomadic herdsmen sought to incorporate the sounds of nature into their singing repertoire(Pegg, 1992, p37-39). It has historically been used for Shamanistic purposes as well as for performance within certain cultures in Central Asia. In other parts of the world Bi-phonic voice has also been used for performance among the Xhosa women in South Africa (Pegg, 1992, p32), for social interaction among the Inuit in Alaska, for traditional ritual in Japan or for religious chanting in Tibet. Because of the significance of documenting the traditional practices before they die out in some cultures, much anthropological and ethno-musicological research has been conducted in the last 35 to 40 years. This interest has stimulated an extension of Bi-phonic voice practice, since the 1980s, into the western world, as either a performance 'party trick' or as an esoteric, sound-based 'healing' practice. This has in turn led to a need to incorporate this practice into 21st century computer generated vocal sound, where much varied research on the acoustic (and therefore vibrational) aspect of the practice has recently become available. This research contributes valuable insights into the potential for using overtone techniques for extending general vocal technique to improve the effectiveness of vocal communication.

The interest in the potential of this vocal technique of using multiple tones in the voice springs from the wide range of sounds produced at one time. Practice of this range within the technique may have an impact on general vocal range and resonance through extending both the vocal and hearing capabilities, as well as utilising what is regarded as the 'healing' aspect of the practice, which may have some impact on relieving some of the tensions that can cause 'blocks' in vocal production.

The reason for choosing this investigation has its roots in the work I do with the voice. As a drama teacher and professional vocal coach, my experience of training the speaking voice has ranged from teaching children whose parents want them to 'learn elocution' to actors in professional productions who need to express raw emotion to an audience, using expert breath control and avoiding damage to the voice, to businessmen honing their public speaking skills. The range of vocal training is wide and infinitely fascinating. It begins with understanding the need for voice and continues through the needs of vocal production for different purposes.

Chapter 2 THE NEED FOR VOICE

In general, unless a person is hindered by a disability, voice is an integral part of communication between people.

Humankind is a social species, where survival and comfort are generally dependent on interaction with other members of the species (Stevens & Fiske, 1995, p189). As such, humans need a means of communicating with other members of their species and, at times of need, or of defence or aggression, with members of another species. Gardener (1963, p19-20) shows that both humans and animals have purposeful communication through sound. Although we communicate with our other senses, Gray and Wise (1959, p11-12) postulate that sound and sight signals carry well over distance, and are thus more efficient communicators. Sound traverses the barriers of light and darkness and one can often hear a sound before its source becomes visible and thus living creatures, being able to emit sound themselves, can use this facility, not only to express pain or fear, but as an effective means of communication (Endler, 1993, 1-12). This use of sound could be considered the voice of the species.

The reasons for the production of voice are mainly social, i.e. rooted in the need for communication between members of a social group. There is a necessity in a social group to give warning of danger, to give and elicit information, and to exert control over others as well as to express the self (Gardener, 1963, p 21).

Most people begin using their voices from that first cry after birth. This initial vocal contribution to communication becomes more complex as speech and language is learned through life as an ‘overlaid function’ to extend the use of the voice

(Anderson, 1977, p5). Although societies can now record the sounds of language into written symbols, and communication can be effected through books, letters, and forms of electronic writing, this 'writing' cannot convey the nuances of communication available to the human voice, nuances in pitch, volume, tone, inflection and even pace of utterance. To support this, well- known modern poet, Maya Angelou, states, "Words mean more than what is set down on paper. It takes the human voice to infuse them with meaning." One could also look at a voice theorist, Anderson, who states that "it is frequently the expressional connotation of words rather than their purely symbolical value that we refer to when we use the term 'meaning' to designate our reactions to what has been spoken" (1977, p187). He quotes the well-known saying "It isn't so much what you say as how you say it' (1977, p188) to emphasise this fact. He then gives examples (1977, p187-251) of instances where vocal variety in terms of emphasis and inflection can change the meanings of the words and follows this with vocal exercises to stretch the range of the voice to assist in the achievement of this vocal variety. Newham expresses the concept succinctly when he states that "the tonal colour of the voice acts as the messenger for our state of mind, moods, emotions and inner attitudes" (1999a, p23).

Although these vocal adjuncts to the words themselves may often be enhanced by visual signals from the face, eyes and even body, it is the human voice that, even in the dark, or through the medium of sound recording, is capable of conveying enormous variations of meaning and emotion through variations in pitch, pace, inflection and tone, and it is to this end that those who use their voices professionally attempt to develop their vocal skills and potential. To move the listener, through use of the voice, to greater understanding or to motivated action, through public speaking

skill, or to tears in a drama and laughter in comedy, is the task of the professional user of voice.

Although it is not only professional speakers who can benefit from optimum use of the voice, this report is concerned with the use of voice in the public sphere, where speakers use their voices continually for their work, often using extended voice to influence or entertain the public (e.g. teachers, preachers, actors), and would thus benefit from some training in this vocal usage both to use voice to the optimum effect and to avoid damage to the vocal apparatus (Berry, 1985, 8, 123-132), which could put them out of work.

Chapter 3

THE NEEDS OF PROFESSIONAL VOCAL PRODUCTION

Professional use of the voice is possibly most obviously demonstrated by singers, with trained singers reaching an enormous range. The Soprano singing Mozart's Queen of the Night in The Magic Flute must reach the note of F in the 6th octave. This requires the vocal bands to vibrate at 1400 times per second, a vast deviation from the norm for women of 200 to 325 cps (cycles per second (McCoy & Halstead, 2004, p110). The South American singer, Yma Sumac, had a range of 5 octaves and in two of her songs on the record, *Voice of the Xtabay,* even reached the very low pitched 'growl' level achieved in Kargyraa Throat singing with its concomitant dual pitches. Singers who train at the Roy Hart institute in France are trained to reach a range of 6 octaves. Generally such extension of the range requires some years of training and exercising to allow achievement without vocal strain.

In normal, everyday spoken voice it may not be necessary to reach the extremes required in singing, but although there is no demand to hit an absolute note, perfectly on pitch, a voice that can travel the range of the octaves is a more expressive voice. A voice that can slide up a few octaves on the elongated question word, "Whaaaaaaaat?" can show more incredulity that a terse monotone, 'What?"

People who use the speaking voice for performance have extended needs from the voice. Turner explains the extended demands of speaking in a theatre in terms of "the necessity of speaking to large numbers of listeners at one and the same time, so that every word carries convincingly…. the actor must be heard by all those who have come to hear him" (1977, p7). Even when the auditorium is not too large,

actors often use heightened language or may need to shout or scream night after night on stage. Many actors will be in rehearsal all day and then perform again at night (Rodenburg, 1998, pxi). The demands of characterisation may require vocal and body usage that would not normally be conducive to good vocal practice. An actor may have to smoke when he would normally not smoke, thus irritating the vocal bands. All the time the actor is experiencing these demands, he has to use the voice in a way that will move an audience and that will convey the words of the playwright to that audience in the best possible way. The text may require an extended range of voice in terms of pitch, tone and power or may require almost a whisper for film work. At all times the actor must be in control of the voice, and if the voice does not meet the demands made upon it, if the vocal folds become inflamed or damaged, there is the possibility of being out of work.

A teacher is also a professional user of voice who is always 'performing' and has different demands on the voice. Speaking above the chatter of a class of 30 kindergarten (or even older) children can place extreme strain on the vocal apparatus. The teacher uses her voice for a large portion of the working day, and may suffer vocal fatigue, but has to carry on the next day. Very often conditions in a classroom are not conducive to good vocal health as the acoustics may be poor. A live acoustic in a classroom increases the general noise level and forces the teacher to speak with more volume. At the same time, maintaining the proper humidity in the classroom for vocal production is not a prime concern of school management. School buildings may be old and suffer from damp, and therefore have mould spores which cause irritation in a vocal tract that has to be used at optimum performance level every day. It is a well-known fact that teachers are prime candidates for vocal nodules (Smith et al. 1997, abstract).

What do people who use voice need to make their voices perform most effectively? This is a question that could fill another Research Report, and thus the answer needs to be summarised. The voice needs to be heard adequately, the words need to be understood and the voice needs to convey the meaning and feeling of the content.

This seems simple, but the achievement of it requires the user of voice to be fit enough to support the breath needed for extension of the voice into a large area such as an auditorium (Rodenburg, 1998, pxi). The core of the body needs to be strong and firm without being rigid, in order to ensure optimum posture to support breath. The abdominal and pelvic floor muscles that control the out breath need to be trained to do so steadily and firmly, and to be able to push the breath out strongly and suddenly when needed, and thus control of muscles and through these, the diaphragm needs to be masterly. All voice needs breath (Rodenburg,1998, p5) to vibrate the vocal bands, and increased demands on the voice result in increased demands on the breath supply as well as control of this breath supply.

To be understood, the diction must be clear. Organs of articulation must be muscular and well exercised in order for the speaker to avoid stumbling over difficult sound combinations. There must be tonicity without tension in jaw and tongue. Unpleasant nasality must be avoided by control of the uvula, to ensure that vowels are released through the mouth and not partially through the nasal passages. .

Meaning and feeling can be conveyed through tone and inflection and it is the range and resonance of the voice that will do this. Range requires excellent capacity and control of the breath. Effective resonance requires control of the organs of articulation and the muscles of the pharyngeal tract. Once again, tonicity without tension is necessary.

These are some of the standard demands of performance voice. Mastery of the points mentioned will enable the speaker to speak the words clearly so that he is understood and to express feeling and intent effectively. Such a speaker will be able to influence the listener by expressing what is in his soul.

Actors will have further demands on the voice due to the requirements of playing different characters. It is not sufficient for an actor to express what is in his own soul. He must express what is in the soul of the character he is playing. This can sometimes be at odds with what his voice would ordinarily express. The actor may have to lose some of his own vocal habits. He may have to adopt a posture or even a costume that is not conducive to optimum vocal support. He might have to produce voice while fighting a staged battle, or while running. Thus his training must encompass the means to do this without causing vocal strain.

To all professional users of voice the threat of vocal strain is pressing. This can occur when the demands on the voice exceed the capabilities of the vocal mechanism. Extended voice, such as shouting and screaming, without adequate breath support, can cause inflammation of the vocal bands (Rodenburg, 1998, 139-140). When the vocal bands are inflamed the user has Laryngitis. This may result in hoarseness (Dysphonia) or even losing the voice, which is the nightmare of all professional voice users. Consequences can be more serious. Continual vocal strain can lead to haemorrhage, nodules and ulcers on the vocal bands, which mean that the voice user will have to abstain from using the voice, which may impact on earning a living or influencing a nation at a critical time.

Such people as actors, singers, and those in the public speaking arena, need to use a greater vocal range and may need to use and modulate volume and tone to a greater degree. To achieve the necessary vocal expertise and to avoid strain they

may use vocal trainers or may embark on a self -help training route to help them develop their vocal skills.

At times in modern society the use of technology such as microphones and loudspeakers may nullify this need (Rodenburg, 1998, p374-377 and The Wall Street Journal, 2009), although it requires knowledge of microphone techniques to counteract the problems created by technology (Rodenburg, 1998, p374-377). Rodenburg also presents the possibility of actors who are used to using such technological advances as microphones, forgetting to support voice, and thus straining the voice in case of technological failure (1998, p376).

Human vocal usage also extends to singing in many different styles, which generally involves extension of the voice both in terms of range and volume. Even gentle lullabies to a baby or hymns in church can extend the range of the voice to a level that can sometimes be uncomfortable. Opera singing requires enormous control of breath and voice to achieve the sublime heights some singers reach (Kleber, et al. 2010, p1-2). Belting out a pop song, backed by a loud band, or using some of the tortured vocal contributions required by Heavy Metal music can be damaging to the voice, and needs special training (Lo Vetri, 2013).

Whether the user of voice embarks on a self-education course or employs someone else to assist, it can be seen that there is a need for training the voice for optimum effect with minimum damage to the vocal apparatus.

3.1 Vocal Training

Although vocal training should be grounded in theoretical knowledge, it is often possible to learn what works and what does not work through experience. Vocal training theorists and other trainers very often develop their own methods through practice and through the problems shown by their students (Alexander, Berry, Hart, Lessac, Linklater, Rodenburg). In addition to practical experience, reading about the experience and ideas of other vocal trainers can also be infinitely valuable, in that one does not have to 're-invent the wheel,' and every theorist has something to add to the field of vocal theory. At times, however, if there is a discrepancy in approach, these additions to knowledge can complicate the path of seeking a solution to a problem.

It has become evident both in practice, and in reading about practice, that no one method of training the voice is best for all students. For instance, Iris Warren was a famed and revered teacher of vocal technique, on whose work many other theorists have based their methods, and yet actor Donald Sutherland (1997) states that Warren's methods 'took away his voice' and that he has since then struggled with his voice and breathing for 40 years.

This shows that every student is different and may have a different need in vocal training. The voice is rooted in the body, and one need only note the wide range of difference in physical structure of students of vocal technique to be aware that varied methods of training might suit different students as they aim to improve and extend their vocal capabilities and release the most effective voice they can.

At times during training both voice user and trainer become aware of hindrances in the optimum use of the voice. These are called 'blocks' to vocal usage and have

been noted by such recognised Vocal Training theorists such as McCallion (1998: 3-14), Eisenson (1979:133 -156) and Rodenburg (1992:19-85).

Physical structure is only one aspect of a complexity of considerations such as physical, emotional or social habits and restrictions which may hinder or 'block' the voice.

When such blocks to the release of optimum voice exist, it is helpful to recognise this fact and to identify the potential causes of these blocks, in order to assist in the releasing and extending of the voice, which may be achieved through various breathing, voice and movement interventions.

For instance, sometime these 'blocks' may affect the breath control of a student and thus the possible range of the voice. At times there may be tension in the vocal apparatus that limits resonance and pitch range. When one considers the 'vocal apparatus' one is in fact considering the entire body structure because the alignment of the body affects the very basis of voice, the production of breath. Very often a block to optimum vocal use may be merely physical, such as a tight or strained muscle, a nodule on the back, or a stiff neck, and may be helped by movement, massage and breathing. Rodenburg (1992, 1994, 1998) and Berry (1973), have written a number of books providing technique training to further this end. Sometimes, however, a block to vocal production may be rooted in personal or societal restriction of emotions. Linklater (1992) provides exercises rooted in imaginative play that will 'free' the voice to reflect the emotions. Newham (1999 a & b), in using the freeing of the voice for therapeutic purposes, provides exercises based in imagery which will do the same. It is recognised that physical exercise can often be used to release both muscle and emotional tension that can cause blocks to vocal production.

There are times, however, when ‘students’ may be restricted in movement, either due to injury or health issues. Very often these are only temporary, but students still need to access release of blockages to optimum vocal usage, in order not to fall behind in their vocal fitness regime. Thus the concept of a meditative vocal exercise such as Overtone Bi-phonic Chanting, that seemed to offer the opportunity to relax, improve breathing, and exercise the resonance and range all in one, invited investigation, not only as a regular vocal practice but also as a potential temporary measure when techniques that usually work may not be possible.

3.2 O*verv*iew of current vocal training techniques

Professional users and trainers of voice production and technique are privileged that well known practitioners and vocal training theorists such as Berry (1973), Rodenburg (1992, 1994, 1998), Linklater (1976,1992), McCallion (1998), Lessac (1967 & 1996) and Houseman (2002), among others, have documented and shared their theories and practice. These differ from practitioner to practitioner, from expert to expert. Some theory and practice is rooted in what they may have learnt from their own teachers and mentors, while some comes from experience and experimentation during the teaching process. For example, Linklater states that the ’framework of exercises’ described in her book, *Freeing the Natural Voice,* was devised by the late Iris Warren, with whom she studied and worked (Linklater, 1976, 2). She also states that from this framework her own work ‘evolved over the years’ due to her own practice and further study (Linklater, 1976, p3). Newham admits to developing his system ‘alone and without a model,’ and to spending ‘many years crawling along the floor…..mirroring the many sounds (his) clients made in order that……with patience and experimental spirit… (he) could …facilitate a more liberated use of voice’ for his clients (Newham, 1999, p9). With such a wealth of theory and documented practice,

and such infinite variety of methods, one could wonder why it should it be necessary to consider searching for yet another method of releasing or extending the voice.

The very fact that there is this constant search for the ideal method for vocal production points to the problem of individual blocks to the efficient production of voice, and individual solutions to these blocks. Students of vocal production range in age from children to the elderly; they range in body structure and in life experience, and therefore not all methods are suitable for every student. Vocal training that may be suitable for an 18 year old may be unsuitable for a 12 year old, whose body has not fully developed and who has not developed the necessary brain/ muscle co-ordination. It is, for instance, generally accepted these days that 'rib–reserve' breathing should not be taught to students before the age of 15 due to co-ordination problems. This is borne out by Hardie, who shows that because the breathing mechanism of children is different from that of adults, they cannot be expected to have the motor control that an adult would (Hardie, 2001, p189), although this has not always been taken into account as Rodenburg remembers being taught the technique as a child (1992, p xii). It is a recognised fact that the male vocal bands continue growing and changing until the male is approximately 25 years old (Rodenburg, 1998, p98). The great experimental trainer of actors and voice, Grotowski, said that it was incumbent upon the actor to regularly re-appraise his training methods and 'rediscover his voice,' as progressing age would alter the body, and cause changes in the voice (Grotowski, 1969, p172-173). Then we need to take into account the effect that life can have upon the body that houses the vocal apparatus. Certain exercises that loosen up the body to help relax muscles in the neck may be unsuitable for a student who has had injury that may impact upon the use of those muscles. Every student is an individual, with an individual body shape

and history of body usage and social cum emotional background. The ‘blocks’ to vocal production that can be presented by a speaker are possibly too many to be enumerated. The very fact that trainers of vocal production are constantly developing new techniques and documenting this process indicates awareness that there is always room for a new approach.

A further reason for this continuing development and documentation of practice is that knowledge about the body is constantly being advanced by science. Theories formulated 30 or even 10 years ago about what was safe in terms of certain exercises may now be superseded by more modern knowledge about body structure. For instance, Linklater, in *Freeing the Natural Voice (1976, p46)*, offers an exercise that involves dropping the head forward, then to the right, then rolling the head backwards before rolling it over to the left and front. This was a popular exercise in the 1970s, based on what was known of some versions of Yoga. Rugby coaches in modern schools still use the exercise, as often evidenced from male students in my current studio practice. Physiotherapists nowadays, however, will condemn this practice, as I have been told by a number of practising physiotherapists, who contend that it is now thought that one should **not** roll the head past the shoulders toward the back. This is borne out in writing on physiotherapy and exercise practice (Kwon, 2013, p15). Later writings on voice reflect this knowledge, and more modern versions of this exercise are offered by Houseman, where the neck is rolled from side to side in a forward position (2002, p136) or with the head supported by the ground as one lies flat (p31) and where the head is gently circled in a forward position as though one is drawing a circle with one’s nose (2002, p137), without passing the shoulder and then dropping backwards.

There may be fashions in vocal techniques that may become outdated in terms of new knowledge and theories. The fashion for Rib Reserve breathing was offered as the ultimate in vocal breathing technique when I was a student in the 1970s, and documented as such by Turner (1977, p2-3 & 23), and then 20 years later by Patsy Rodenburg (1997, p64-66) as an **historical** technique. It is now considered to be at odds with aspects of the Alexander Technique, which is widely used in vocal work to align the body correctly, and so modified versions of the technique are offered that call in muscular control without the rigidly held ribcage (Houseman, 2002, p64-117).

What can emerge from reading the works of many vocal training theorists is that their explanations of the process of producing voice often differ slightly as they dip into varying theories to support their own viewpoints, or perhaps explain a limited viewpoint. This could lead to an incomplete understanding, on the part of a reader, with respect to the total process of vocal production and this may have an impact on the final outcome of a vocal improvement programme. In terms of understanding whether a new technique such as the use of Bi-phonic Voice might be efficacious it is necessary for a **vocal trainer** to ensure that all aspects of vocal production are clearly and completely understood.

Some theorists prefer not to blind a student of vocal technique with science, as many students of vocal production are more interested in the interpretative aspect of vocal training than in the scientific aspect. Thurburn (1949, p22), in the position of Principal of the Central School of Speech Training and Dramatic Art, was of the opinion that for students "…some knowledge of anatomy and physiology should be attained, but a detailed study is necessary only to the specialist…. a detailed study … is more likely to hinder than to help as a general rule." She justifies this view on the grounds that some parts of the voice mechanism such as the vocal bands

‘function unconsciously’ (Thurburn, 1949, p22) and that it is potentially dangerous to the vocal mechanism and to the creative interpretation of vocal needs to try to control these as “no amount of knowledge can bring about direct control” (Thurburn, 1949, p24). Thus an over-view of technical aspects, with simplified diagrams, followed by the exercises to aid interpretation, is what will interest that particular readership. While some may consider her views outdated, Rodenburg (1992) and Linklater (1976) also try not to overload the student of voice with too much science.

Thurburn qualifies her opinions by stating: “Detailed study of its action is helpful only to the specialist who has to deal with failure to produce sounds… correctly” (Thurburn, 1949, p24). Trainers of voice must be included in this band of ‘specialists’ as they are the teachers who help students (actors and singers) to work their way through the blocks to optimum vocal production. Trainers of vocal technique must be more aware of the physical and physiological aspect, as lack of knowledge in this field can lead to damage to the students’ vocal apparatus. Without this awareness, theories that seem to contradict each other can contribute to misunderstanding.

The constant quest for knowledge in science leads to the constant updating of knowledge in the field of voice training. With this comes the awareness that constantly developing technology and changing stresses of modern life may result in blocks to vocal production that require new solutions. It is in this spirit, in the search for something new, that I undertake this study of current vocal training methods to compare them with a method that is not in general use, in order to see whether there might be any benefit in including aspects of this method in vocal training.

Chapter 4 RESEARCH APPROACH

In order to understand and present the physical and physiological means of meeting the needs of professional vocal training I have employed a qualitative study, based on synthesizing current literature from a wide number of sources and fields of study that relate to all sections of this report in order to review the scholarship available..

This study of literature is followed by analysis of structured questionnaires on the use of bi-phonic voice and interviews based on these questionnaires with a selection of people who practise Bi-phonic Voice. This was done to assess individual responses to the practice in terms of comfort and perceived advantages or disadvantages of the practice. The outcomes of this analysis were compared with the review of the scholarship available on the subject in order to speculate on the potential benefits and disadvantages of the practice and thus to draw some conclusions regarding the use of this practice in vocal training.

Participants in the study were to be a selection of people using the practice of Bi-phonic voice in their professional lives. These participants were personally invited to participate as professionals in their fields, who could be quoted as a professional source of information. In such an instance, in terms of Ethics rules at the University of the Witwatersrand, it was deemed necessary to gain ethical clearance. Consent was obtained from participants to quote their responses in this report.

Chapter 5 LITERATURE SYNTHESIS

The first step in accessing literature on the investigation was to ensure adequate understanding and explanation of the technical and scientific terms used, as the report examines the physics and then the physiology of vocal production. To a practising drama teacher and voice coach, with a background more in the arts than the sciences, and expecting a readership in the same field, it seemed that definitions of voice, vibration and other terminology in various dictionaries were limited in scope A database search in books and journals began with a text book used for High School Physics (Sang, 2010) and the World Book Encyclopaedia (1992, p 46-54), which gave more comprehensive explanations of sound and provided definitions of terminology of the field. Gray and Wise (1959, p 66-134) give a clear explanation of sound and vocal vibration but it was felt that, due to the age of the information, more up to date sources should also be consulted. Progression was made to first year Sydney University Physics of Voice course notes (Wolfe, 2005), and to a very clear exposition of acoustics and the source-filter model of voice production from the Macquarie University (Cassidy, 2002). A masters dissertation on acoustics phenomena in multimedia (Braine, 2006) followed, which opened up the area of binaural beats and entrainment, encompassing the brainwave patterns that may be stimulated by the meditative overtone chanting, as well as the effects of low frequency sound within its discussion of infrasonic sound. These serve as a necessary basis for more technical and complicated discussions which follow in journal articles such as offered by Kent (1993).

For the background study of currently used vocal training theorists, to explain phonation and resonance, it was found that, because the books are meant to be practical books for students of voice who are not scientists, the descriptions of the

actual production of voice and what happens during resonance are in many cases simplified. Berry (1973) helps actors by explaining the processes of phonation and resonance through similes, using a common analogy for the vibration of the vocal 'cords', that of the strings of a violin (p9). This is useful in terms of understanding pitch, but somewhat misleading in terms of other aspects of breath and phonation, as the vocal bands do not operate in the same way as a violin string. Although Berry does not mention this, the image of the string or violin is a successfully graphic image used to explain the concept of harmonics or overtones by the World Book Encyclopaedia. Rodenburg (1992) states that she dislikes 'unsightly' diagrams (p115) and 'vocal texts that seem to be terribly clinical and strain too hard to be like medical texts' (1992 – Intro) and proceeds to use similes for her descriptions of the vocal instrument and vocal production, interspersed with practical instruction. Linklater (1976) uses description in the same way, while providing amusing comic-style diagrams throughout the book, as does Houseman (2002). As a student and teacher of voice I have always loved these books because they make the entire process of learning about voice less intimidating. When trying, however, to form a clear picture of the entire process of vocal production, and to find solutions to some vocal problems that are not emotional or cultural as posited by Rodenburg (1992, p 3-109) & McCallion (1998, p 3-7), the more clinical approach, with more clinical diagrams, offered by Anderson (1977), Eisenson (1979) and Colson (1983) is useful to the teacher of voice.

One difficulty has been that many vocal training theorists present different approaches as to what happens with phonation and resonance, along with varying use of terminology. This is well illustrated in Smith's Monograph on the varied methods of teaching of resonance and range by 10 different professional vocal

technique trainers (Smith, 2005). A further consideration in looking at available literature is that some books still used were published as many as thirty years ago. As knowledge is always changing, this validates the initial task of researching more current and scientifically based information as to what actually happens in the physics of vocal acoustics.

Had it not been for an awareness of these differences in perspective as to how voice is produced, Anderson's very comprehensive exposition of sound in relation to voice and speech (1977, p445-461) might have sufficed. He discusses the physics of sound in a method understandable to those who are not physicists. His discussion applies the four basic factors of sound, time, pitch, loudness and intensity (Anderson, 1977, p450) to the structure of the human body and the production of voice for communication purposes. His description of the process of Phonation is comprehensive but does not equal that of McCoy, in chapter 9 of his book, '*Your Voice – an Inside View'*, where the intricate exposition of the workings of the larynx is enlightening. Anderson moves from the initial vibration of the vocal bands in the larynx to a discussion of the various forms of vocal resonance that may be possible, highlighting the fact that what many vocal training theorists term 'sympathetic vibration' is possibly just an example of forced or 'sounding board' vibration (Anderson, 1977, p459). Such discrepancies in terminology make reference to physicists' readings necessary. Anderson's discussion forms a bridge between the vocal training theorists who focus on three main cavity resonating areas in the body and those like Lessac, whose discussion of resonance involves the sounding board resonating areas, and who uses different terminology for what happens to sound in the cavity area (Lessac, 1997, p13-14). Current theories from journal articles and from Newham's writings pose the idea of Tube resonance of the upper vocal tract,

which is part of the ‘cavity’ and somewhat discount the efficacy of the ‘sounding board.‘ Anderson very systematically shows the user how to attain the optimum use of breath within body posture to vibrate the vocal bands, in order to best utilise the various resonating areas within the body. He offers reasons and practical solutions for many problems in vocal production that have a bearing on optimum use of vibration.

Colson, on the other hand, has a limited discussion of resonance areas of the body, focusing on the cavity resonance, which she calls ‘hollow space’ (Colson 1983:32-35), but has very clear information on tone quality and on resonant pitch and the frequency of vibration related to the size, shape and tonicity of those cavity resonators (Colson 1983:34-47). This leads to the use of the resonator scale (Colson 1983:37), based on musical notation, which other standard theorists, apart from Turner, seem not to use in such a specific way. However resonant pitch is covered very specifically in Sundberg’s article (1992) as he discusses its importance in the vibrations of different vowel sounds that may be felt in different resonating areas of the body to help the tuning of the voice.

The optimum conditions for the vibrations of resonance are important to all vocal production practitioners, and it is in this area that we find interesting divergence in methods of coaxing the voice into resonance and range. When we look at techniques for developing range, Colson, being of the school that has historically had a strong focus on technique with good breath support, uses formal exercises to develop range using her resonator scale, as opposed to Linklater's later use of visualisation, bodily involvement, awareness of the chakras and the perceived vibrations of the sounds themselves, to first embody the sounds (Linklater, 1992, p11-23). This leads to a use of a vowel scale (p 23-26) that is less dependent on

specific pitch to develop range in a different, more physical way from Turner's and Colson's, to stretch the voice and free the eventual speaking of the text.

The physical sensation of sound, and the muscle and vibration memory, rather than the ear, when reproducing sound is also Lessac's aim *(*1967*).* His theories become relevant to my study in his slightly different perception of resonance and vibration. Much of his focus in resonance is on directing sounds through the bone structures of the body for vibration rather than relying only on cavity resonance, although the importance of the cavity for timbre is recognised in the use of the 'inverted megaphone' oral shape he prefers students to use (Lessac, 1967: 17-18). Lessac's Y-buzz (1967: 79-94) and 'Call' (1967: 110-128) have become standard training tools for developing the use of resonance vibration.

The 'call' is also used by Houseman (2002:105-107) in her training, with great emphasis on breath support to enable the sound, while Michael McCallion (1998), influenced by Lessac, is very focused on feeling vibrations and using a variation of Lessac's Y-buzz, called the 'body-buzz' (McCallion, 1998:77-79) to become aware of the vibratory quality of vowel sounds.

Resonance will always be better when the body and mind are free from the 'blocks' that can prevent a full range of vocal production and very often the process of attaining good voice involves a process of freeing the self from these physical, intellectual and emotional blocks. Most of the vocal training theorists mentioned above address this aspect in some way or another. Patsy Rodenburg writes at length of the blocks to vocal production (1992 & 1994). Linklater's aim (1976) is to free the person by freeing the voice. This is also the aim of voice therapists such as Paul Newham (1999, a & b), who uses physical actions and visualisation to change the length of the vocal tract, or 'pipe' in order to free different vocal qualities. This altered

vocal tract must affect the resonance, as is borne out by Kent (1993) and Cassidy (2002) as well as by writers commenting on vocal usage for Extreme Metal singing. (Smialek, et al. 2012) McCallion's book is rooted in the Alexander Technique, where the body is the home of the voice and thus he gives a fuller understanding of the workings of this home, and indicates the effect of postural habits as blocks to vocal production and shows the means to correct these (McCallion, 1998: 3-65). Further useful information on this now generally accepted use of the body for voice production and changing of lifestyle postural habits is offered by. McEvenue (2002) and Vineyard (2007). Feldenkrais', while not specifically a voice theorist, offers a contribution to the safe production of vocal vibrations by addressing postural problems (which would cause blocks) that may have to with habits of self- image. (1990). The process of using the body to enable voice rather than dissociating the voice from the body was also used by Grotowski, who used movement to unlock this voice. It is clear in *Towards a Poor Theatre* (1969) that he was commenting on and reacting to actor training as it was in the 1950s and 60s. Rather than using very formal, repetitive exercises he uses visualisation to help the actor to use his minimum of nine different areas of the body as amplifiers for the voice (1969, p36), and his resonance exercises show a use of areas of resonance not generally used consciously. His awareness of Eastern techniques includes extreme Yoga and also Laryngeal resonance, or Overtone singing, however, he does not explain exactly how this works but rather seems to use animal imitation to trick the voice into achieving this. The visualisation used for the animal and bird sounds calls on mimesis, which is also the method used by traditional Tuvan teachers of throat singing, where listening to the sounds of nature teaches the student singer the sounds for which he creates a metaphoric equivalent (Levin, 2006). Grotowski is adamant that the entire body is a tool for resonance, and that 'in the vocal process, all parts of the body must vibrate'

(Grotowski, 1969, p184) and that the timbre of the resonance will change with the movement and alignment of the body. Grotowski's theories and practices are of interest to this study as these vibrations of Overtone singing, also accessed in Estill Voice Training, but not by any of the other theorists mentioned, can ostensibly enable access to vocal range that is not usually used. Allied to Grotowoski's theories on movement to produce voice are Newham's exercises which use physicality to open up and train the resonant 'tube' before exposing his clients to the vocal stress of therapy that might stimulate the use of raw and violent vocal expression. Newham's approach uses the extension of the voice through these tubes as a personal therapeutic journey for his clients.

Moving away from standard Western Voice production to focus on Bi-phonic voice, Carole Pegg, Britain's foremost scholar of Mongolian music, in her book (2001) and journal articles on Throat Singing (1992) discusses social as well as physical aspects of the practice as does French-Vietnamese ethno-musicologist Tran Quang Hai in various articles, and American ethno-musicologist Theodore Levinwith Suzukei, in their seminal book on Tuvan and Mongolian music (2006). Here the well-researched past meets the present in the presentation of the emergence of Tuvan throat singing into the Western world as the Soviet Union crumbled. The clarification of the shamanistic/animist aspects of throat-singing through discussion with singers is particularly interesting for this research report. Both Pegg and Levin also mention the Bi-phonic singing of the Xhosa women of South Africa (1992:2), who are further discussed in Dargie's article (1991) a news report (Milton, 2011) and an interview with Professor Zaidel-Rudolf (Van Wyk, 2008). Zaidel-Rudolf has also written an article which explains her usage of the Xhosa overtone singing in her composition,

‘Lifecycle’, but does not analyse the vocal production in any detail (Zaidel-Rudolf, 2006, p1-2).

Other journal articles that have been read on Throat or Overtone singing include four by Sakakibara et al (2001, 2002, 2004 & 2006), discussing varying vibrations in the larynx during Throat singing, and one by the musicologist, Tsai (2005). Sakakibara’s studies on human voice are conducted with a view to replicating human voice in computer generated voice and his articles cited are often the content of talks given at conferences and have good visual and diagrammatic support for his facts. Tsai, an assistant professor of musicology at the University of Taiwan, has a special interest in overtone singing. His conference papers on Sygyt and Kargyraa singing are of particular interest from a physiological point of view and because he adds to the controversy as to whether certain forms of bi-phonic voice have a dual source or whether the harmonics are all formed in the filter area. Background information on Overtone singing and methods of practice can be obtained from a number of websites for overtone singing interest groups, as well as from You Tube videos. While these may not always be academically quoted, they serve as a stimulus for keywords to source what might be considered more academically acceptable papers, and certainly gave this writer some idea of how to attempt the practice.

It was felt that, if the vibrations of Overtone singing were to be investigated with a view to using them in vocal training, the possibility of vocal damage and the means to avoid it needed to be fully explored. In vocal training there is always the concern that any sound that is not in the normal repertoire might lead to vocal tract damage through strain if not properly supported and trained for, and thus the sounds produced in bi-phonic voice, especially the extremely deep and growly Kargyraa voice and Tibetan chanting, with their close audible links to Vocal Fry (Creaky Voice)

required a search into literature to investigate the concern. There seem to be varying attitudes in the literature as to whether this form of singing can be detrimental to the vocal apparatus. Cielo et al.(2011), in addition to a number of web sites for 'Voice' clinics, show that 'Vocal Fry' can be damaging to the vocal folds and is regarded as a form of dysphonia, with the increasing popularity of this form of vocal use amongst young women today being a cause of concern. While Kargyraa voice and Tibetan chant are not Vocal Fry, there are some similarities in formation of the vocal sound, including lowering of the larynx, and use of the Aryepiglottic folds (in Tibetan chant) and thus the concern. If the practice causes the same kind of strain that Extreme Metal singers, who also use a growl voice amongst other voices, undergo, there might be the danger of nodules or ulcers on the vocal bands through the strain reported by Eckers, et al (2009). Pegg records reports of vocal damage and societal limitations on women performing throat- singing (Pegg, 1992:10). Sakakibara et al. on the other hand, researching at a later period, say no damage is caused to the vocal folds (Sakakibara, et al. 2002:4). Although Levin describes throat tension and effort being used for Overtone singing, an article by Bagnell and McCulloch (2005) indicates that using effort to control the vestibular folds in Fitzmaurice's 'Voiceworks' tended to have a positive rather than a negative effect on vocal production and comfort. In spite of the literature that advocates relaxation as a means to eliminate blocks, Grotowski was also of the opinion that complete relaxation was not conducive to good acting or to good voice (Grotowski, 1969). The Eskimo women playing their throat singing games as described by Nattiez (1999), have no adverse reactions reported, although their throat singing is different from the Tuvan style. There is likewise no report in Dargie's article on Xhosa women's throat singing (1991) that indicates any adverse effect. It is possible that the manner in which Tibetan Monks produce the low sounds, which are similar to *Kargyraa* chanting, **through** meditation

and very deep breathing, may possibly prevent vocal damage due to the relaxation induced by meditation, as postulated by Tsai *(2005)*.

Nielson has also explored the practice of overtone chanting (2004, p 105-114), on which she included a focus group study for her published doctoral dissertation. The information in the book is summarised, but the dissertation (Nielson 2000) shows results from her Overtone singing research group with regard to therapeutic intervention. Others who focus on the therapeutic benefits of overtone chanting, such as Sound Healing experts, Wayne Perry and Dr Mitchell Gaynor, and music therapist, Don Marquis, are persuasive in their argument for the benefits thereof but need more academic verification for their claims.

Database searches on the internet revealed articles on overtone chanting and singing that tend to focus on the scientific acoustic aspects of the vocal apparatus necessary for this study. These articles cover the different forms of Overtone singing and point out the differences between them, discussing and arguing about the relevant sources and resonances of the sounds produced. Peer reviewed records on its use in western vocal training for the speaking voice are sparse, apart from those that mention Grotowski's methods, where his actors were renowned for their resonance and vocal quality. These articles do not discuss the exercises and their effects in detail, so the method of throat singing he reputedly used is not documented by these, and the study therefore looks at reported effects from other sources. Estill Voice Training is directed at singers and actors and uses the growl of *Kargyraa* voice, but while Estill is cited in the areas of vocal health and vocal synthesis, she was better known for her research relating to 'Belt' voice. Most esoteric voice healers testify to the relaxing effects of Overtone chanting but because this practice is so often linked to meditation, experiments in this area seem to focus on meditative brain

activity rather than the state of muscles in the vocal production area, so we thus look more to the scientists interested in computer simulated voice to provide ongoing research into overtone singing.

SECTION 2 ***PHYSICAL AND PHYSIOLOGICAL PROPERTIES OF VOCAL PRODUCTION***

Chapter 6 VOICE AND VIBRATION

In considering the needs of producing voice and the training for more effective use of the voice, I return to the lens through which the various aspect of voice are to be viewed. Vibration is an aspect of voice production that is integral to **producing** the vocal tone, to **amplifying** it for communication and performance, to **hearing** the sound we are producing and also, potentially, to **using** it for therapeutic or vocal release purposes. In order to optimise the use of vibration the entire body comes into focus, whether as a causative and supportive factor, or as a recipient of vocal vibrational therapy that may be able to release the voice (Newham, 1999).

Generally people do not think of this consciously when speaking. Although aware that other people's voices have an effect on us, we are less consciously aware of the effect of the vibrations of our own voices on ourselves or of the vibrations that produce this voice. For the professional voice user and trainer, an awareness of vocal vibration can not only be useful but possibly essential. Knowing what affects vocal vibration can be an aid to producing more resonant voice with less damage to the vocal apparatus (McCallion, 1998:3 -28, Rodenburg 1992 & 1994). Being aware of the vibration of one's own voice both through hearing and through the body, has potential use in tuning and modulating the voice (Sundberg, 1992) (Verrillo, 1992).

Not much seems to be definitively known of what effect vocal vibration may have on the speaker in other ways, although sound healing practices ostensibly use these

vibrations for practices ranging from freeing restricted voice and therefore making people feel happier with themselves (Newham, 1999 a & b) to dispersing blood clots (Campbell, 1977, p 3-9). Some of these theories, however, still require academic validation rather than anecdotal evidence.

6.1 What is Vibration

Vibration is the periodic, harmonic, movement, backward and forwards, in place, of an object, when it is 'disturbed from a position of stable equilibrium, and, as a result, continues to move back and forth around that stable equilibrium position' (Advameg. 2011, p2). It is more scientifically called 'oscillation' and occurs in all matter at molecular level. Gray and Wise (1959, p 68-70) use two examples, firstly of a spring and secondly of a pendulum, to clarify the motion of oscillation. The pages can be summarised as follows: A spring has *elasticity,* which will cause it, if it is moved from its position of rest, to move back to its original position or shape. It has, however, to contend with the quality of *inertia,* which causes matter to either 'remain at rest or in motion until acted upon by an external force' (Gray and Wise, 1959, p69). This means that, without an external force to stop it at its position of rest, the spring will carry on moving past this position of rest until the 'restoring force' of elasticity causes it to reverse direction once again. This back and forth movement will carry on, with the distance beyond the point of rest diminishing due to friction, until the spring loses momentum and comes to a final halt at its position of rest, This movement of the spring is called oscillation, or vibration. A pendulum will follow the same movement pattern in much slower motion.

Oscillation will generally involve the movement of an object comprised of varying matter, for instance, the pendulum of a clock, a spring or, on a larger scale, the

tectonic plates beneath the earth's crust. The movement of the vocal bands in voice production is oscillation. Depending on the composition of the matter, the rate of the oscillation will vary, giving every object its own frequency (defined later).

This Oscillation can be graphically captured by physicists, using mathematical processes, in what is called a *sine curve,* and is referred to as *harmonic motion*.

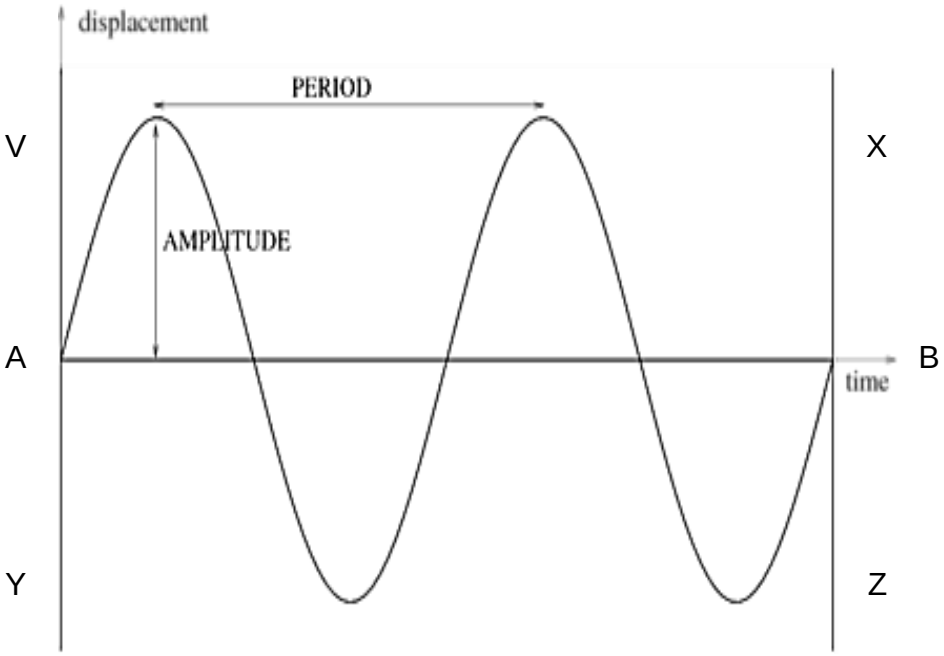


Figure 6.1 Sine Curve, after 'Pass my Exams – GCSE Science- Waves' using lettering added by writer

In Figure 6.1, any point on the line AB could be considered the 'point of rest and the points along the lines VX and YZ show the displacement from the point of rest. . '

Periodic, harmonic movement that does not necessarily involve **matter** is called **wave motion**. In this case **energy** is moved from one place to another and back again. If wave motion is composed from matter, such as the water in a wave in the ocean, it is called a **mechanical wave**. The movement of energy through the water is a wave. A sound wave, where there is movement or vibration of energy through air, without displacing the air, is likewise a mechanical wave.

Waves can have 2 shapes, transverse (up and down) and longitudinal (moving outwards in concentric circles on a horizontal plane). In a transverse wave as shown in **Figure 6.2~~Figure 6.2~~~~Figure 6.2~~** the wave itself may be moving forward but the vibrations will be moving up and down, perpendicular to the direction of the wave's movement. This kind of wave is called a sinusoidal or transverse wave.

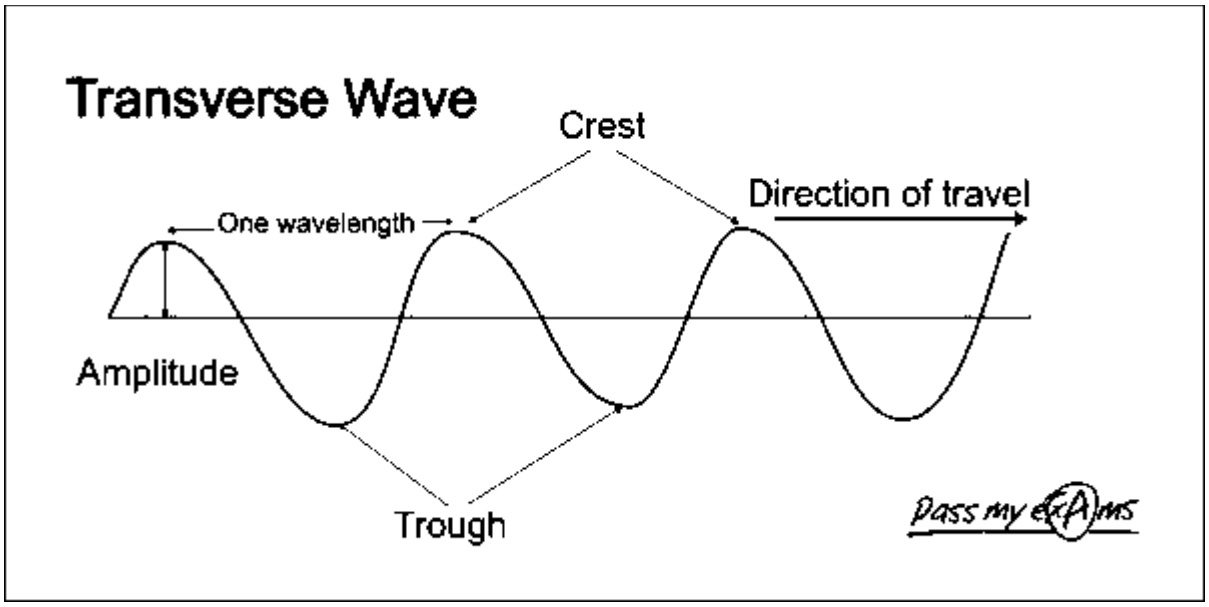


Figure 6.2 A Transverse wave Image from 'Pass my Exams – GCSE Physics

When the wave is longitudinal, the vibrations move in the same direction as the wave itself is moving. This results in the wave moving in a circular fashion radiating out from a central point, and the vibrations do the same thing. Thus sound does not only move in one direction but spreads around its point of origin. A visual image could be that of a coiled spring that is held tight and then released so that it compresses and loosens or 'rarefies' in the direction the sound wave is travelling, as in Fig 6.3.

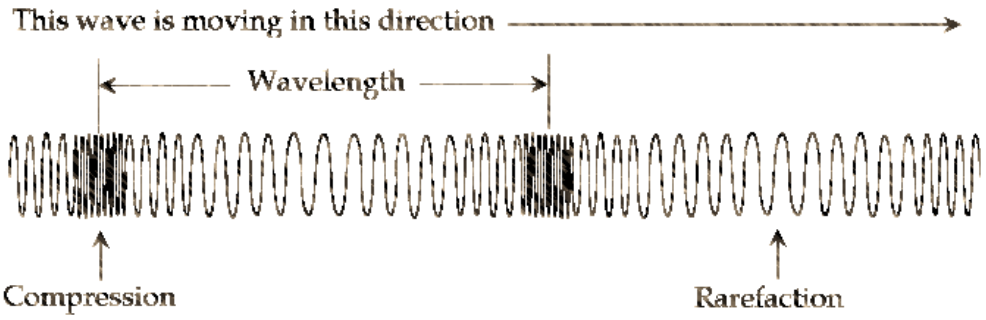


Figure 6.3 Longitudinal Wave from BCSE Science.com 2-Waves

Figure 6.4~~Figure 6.4~~~~Figure 6.4~~ that shows the difference can make wave forms clearer, where “a” is a visual image of a longitudinal wave and ‘b’ an image of a transverse or sinusoidal wave.

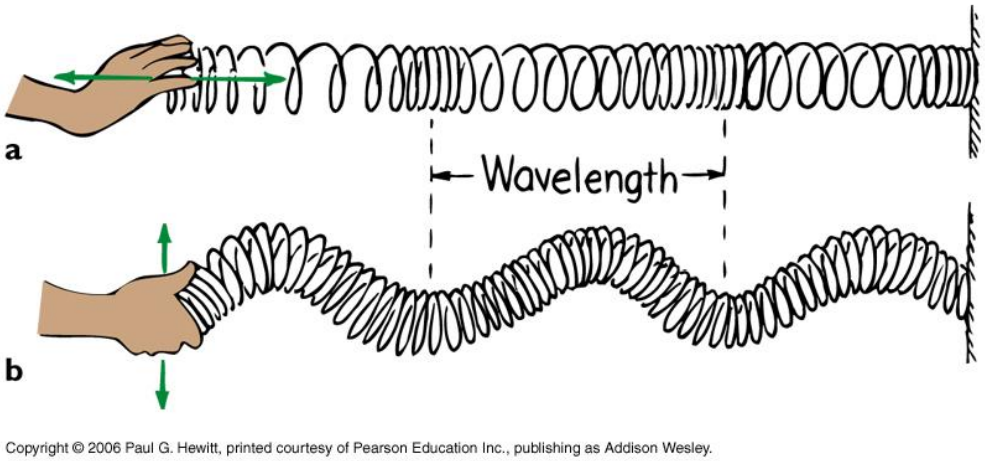


Figure 6.4 contrast between (a) longitudinal and (b) sinusoidal wave. (Hewit, 2006)

Both waves and oscillation have properties that are measurable. These properties are:

- **Amplitude**, which can be regarded as the ‘size’ of the displacement from the original position. In oscillation (e.g. vibration of vocal bands) it will be the extent of the movement of the vocal bands from their position of rest. In the wave of sound that is produced, amplitude is “the maximum value of the pressure change between waves” (Advameg 2011, p4), or ‘the … measurement of the degree of change (positive or negative) in atmospheric pressure (the compression and rarefaction of air molecules) caused by sound waves. *(*Hass, 2003, p1*)* This means that *“*sounds with greater amplitude will produce greater changes in atmospheric pressure from high pressure to low pressure” *(*Hass, 2003, p1*).* This acoustic energy is the **intensity** of a sound**,** to which amplitude is related. On a sine curve, Amplitude can be graphically indicated as follows in Fig 6.5, being marked by the deviation from the median line shown by the troughs and crests:

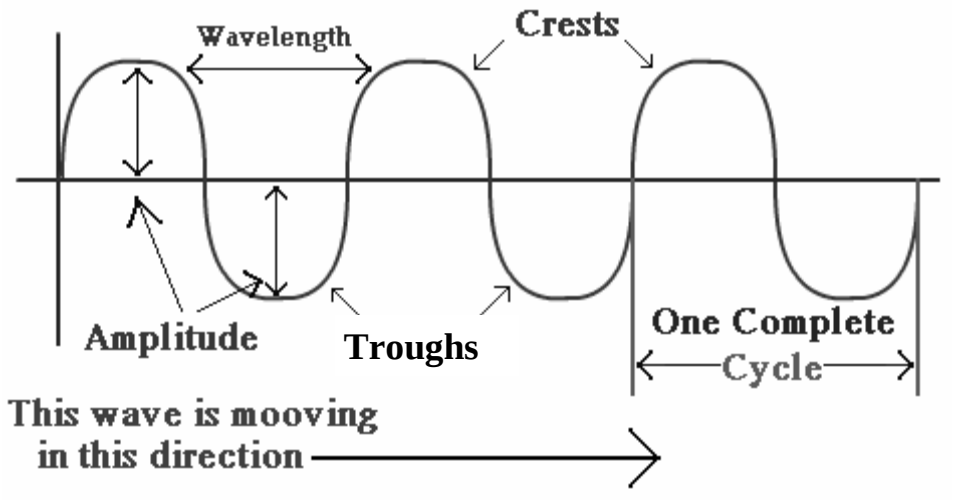


Figure 6.5 Sine curve showing Amplitude (Tutorvista.com)

Amplitude will be heard as **loudness** and physically it is generally assumed that it will have nothing to do with the frequency of the sound, although with vocal production intra-trachial pressure can affect the frequency.

- **Period,** which is the time taken for completion of a cycle (Advameg, 2009). In oscillation (e.g. that of the vocal bands) it will be the time taken for a cycle, either from position of rest to furthest extension on one side (crest), back to position of rest then to furthest extension on the other side (trough) and back to the position of equilibrium, or from one crest or trough to the next crest or trough. (See Figure 6.5~~Figure 6.5~~~~Figure 6.5~~) In a sound wave, which is longitudinal, it will be the space of time (interval) between waves. The measurement of periods will be expressed in seconds or part thereof (Advameg, 2009).

- **Frequency,** which will be the number of cycles per period (i.e. per second), both for oscillators and for waves (Advameg, 2009). Thus the period of a vibration is very closely linked to the frequency. Although the measurement is per second, the terminology currently used is Hertz (cycles per second). Thus if an oscillator (e.g. vocal band) is vibrating at 10 Hertz it means that it will complete 10 cycles per second. If a wave of sound has a frequency of 10 Hertz it means that 10 waves of the sound will pass a certain point in one second. The greater the frequency of vibration, the higher will be the sound produced and heard.

6.2 What is vibration with regard to vocal production?

Voice is sound, and therefore voice IS vibration.

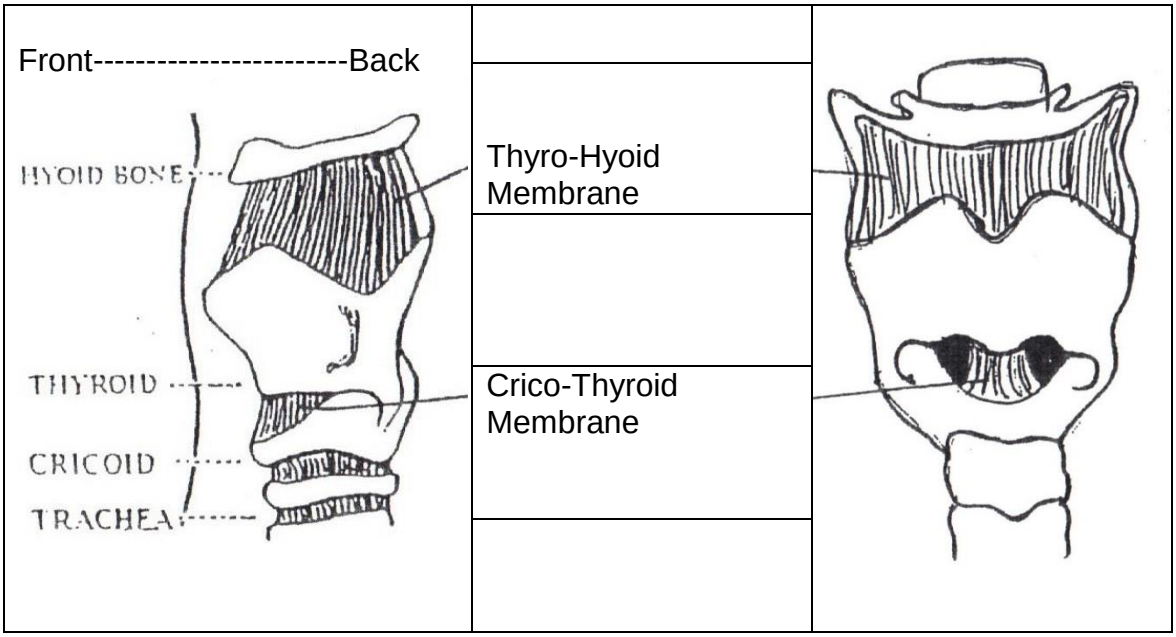
The previous section showed how sound can be thought of in terms of motion through matter using energy. The physicists showed that sound consists of physical vibrations of a sound source, which set up "waves" in some transmitting medium such as air. These waves are propagated through the transmitting medium and are carried to the ear where further responses interpret them as sound (Lions Voice Clinic, 2012).

This section of the study will show how the physiological aspects of the vocal tract produce the vibrations that we hear as voice. Writers on voice such as Linklater and Houseman provide simplified diagrams that explain the basics of vocal production graphically to students of voice interested in how to travel the journey to vocal interpretation. It is, however, felt necessary for the purposes of this study to understand in more clinical detail the physiological structure of the vocal apparatus in order to understand how vibration occurs within this structure and what effect the vibration has on the vocal process, which includes:

- the initial production of voice called phonation
- the amplification and resonance of this initial sound
- the hearing of the sound
- the use of ‘performance voice’ using techniques to enhance vibration

6.3 Phonation

Phonation is the process of producing the initial vocal sound by vibration. This happens in the Larynx, commonly known as the 'Voice Box.' The Larynx, approximately the size of a walnut, is situated at the top of the Trachea, or 'wind pipe', and is attached above to the Hyoid bone. It is constructed of cartilage, muscle and connective tissue or membranes as can be seen in the diagrams following in Figure 6.6.



Side View

Front View

After Colson, 1988, P28

After Anderson, 1977, P72

Figure 6.6 Views of the Larynx

The arytenoid cartilages of the Larynx are seated inside other cartilages and the following diagram will show their position.

The EPIGLOTTIS is a cartilage at the top end of the Larynx, functioning to seal off the entrance to the Larynx when swallowing to prevent food entering the respiratory tract.

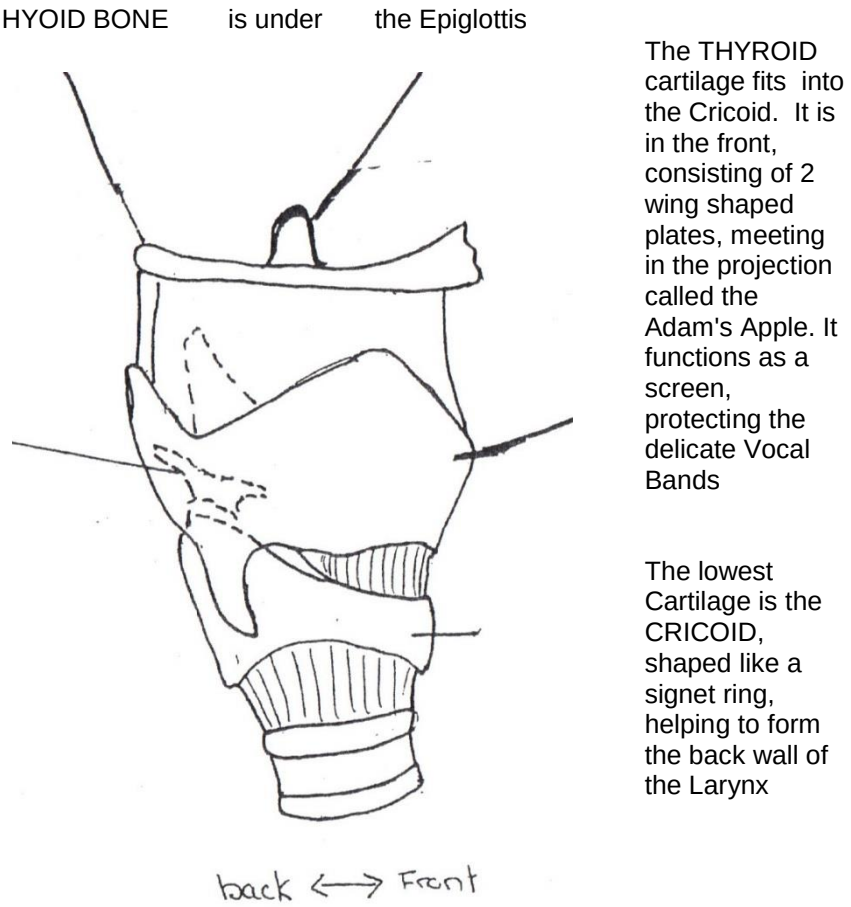


Figure 6.7 Side View of the Larynx

Own composite after Anderson, 1977 P74 (Interior of the Larynx) & Colson, 1983, p28

This structure of cartilage houses the vocal bands, variously called the vocal folds or vocal cords or even vocal chords, which consist of 2 folds of ligament and elastic tissue. It is these Vocal bands which are the initial vibrators that produce voice, although it is not their primary function.

The structure of the vocal bands is as follows (Figure 6.8).

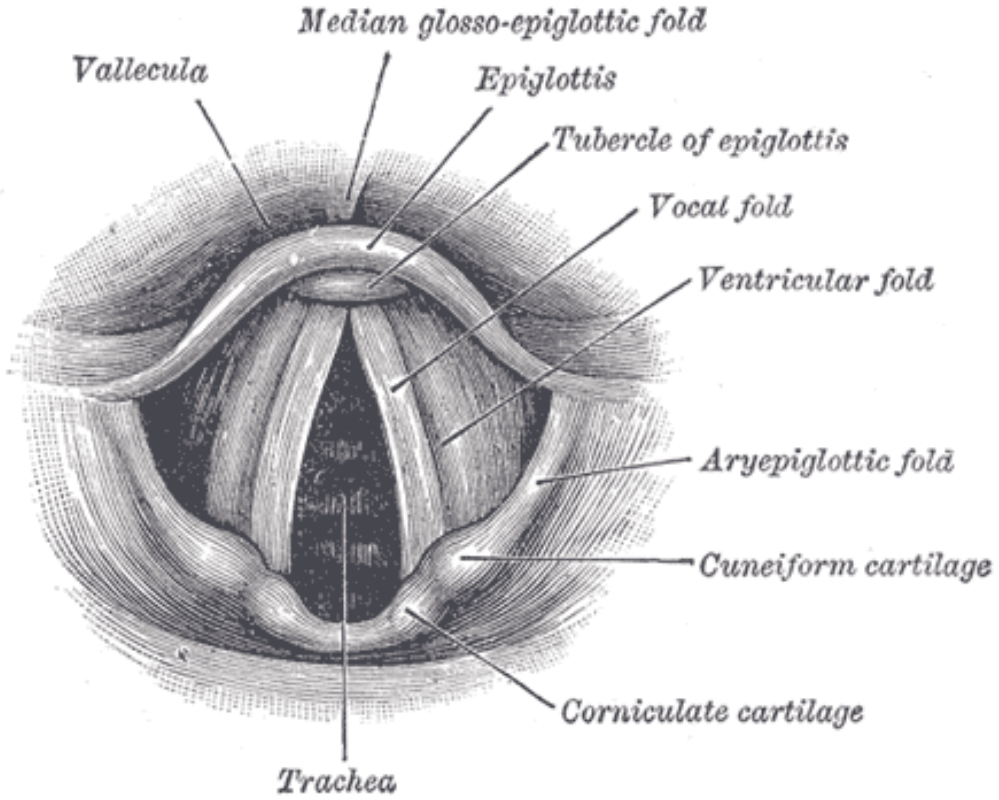


Figure 6.8 Image of Vocal cords from Stanford School of Medicine –Images- Vocal Cords

The front end of these folds is attached to the joint of the Thyroid cartilage. The other ends are connected to the two Arytenoid cartilages at the back. Muscles cause the rotation of these cartilages, which in turn can cause the folds to come together or be separated. They can also be tautened by the tilting of the Cricoid cartilage. The opening between the folds, leading into the Trachea, is called the Glottis. It is through the glottis that the passage of air from the lungs passes, both in breathing in and in breathing out. The inner folds of the Vocal bands, under stress from vibration, are protected and strengthened by the FALSE VOCAL CORDS above and extra tissue around them, including the ARYEPIGLOTTIC FOLDS or LARYNGEAL COLLAR.

The False vocal bands or ventricular folds, sometimes called the ventricles of Morgnani (Gray & Wise, 1959, p182), are not used in normal spoken vocal

production. These are fleshy folds that have been considered in much literature of the voice to be situated as they are to protect and lubricate the vocal bands from their own mucous membranes (Gray and Wise, 1959, p 182) or to protect the trachea during swallowing of food (Anderson, 1977, p79). Use of these false vocal bands in normal phonation for Western speech has sometimes in the past been considered ‘a type of defective voice (Anderson, 1977, p 80, 90-91). In other cultures, however, such as some Asian languages, their use and the type of vocal sound they produce through squeezing the larynx so that they can come in contact with each other, is acceptable, and is called ‘squeezed’ or ‘pressed’ voice. This squeezing of the Larynx is used in the production of certain forms of Bi-phonic voice.

Similarly the Aryepiglottic folds are not used in normal everyday phonation, but can contribute to what in some jazz singing and Extreme Metal is termed ‘growl’ voice. We will see that they may also be called into use for certain types of Bi-phonic singing.

It is generally accepted that the primary function of the larynx is not the production of voice, but respiration (Anderson, 1977, p69). This small structure allows air into and out of the lungs and prevents any foreign matter from entering the lungs. The air travelling to and from the lungs passes through the glottis. This is a silent passage of air. When we breathe normally the vocal bands are drawn apart and the glottis is open.

Should any foreign body enter the respiratory system, the vocal folds in the Larynx can be pulled together, closing the Glottis. The foreign body can then be expelled with a sudden opening of the folds and outrushing of compressed air, which we call a cough.

A further function of the Larynx is to close the Glottis to keep air within the lungs to assist the body in certain muscular efforts of the arms and abdomen, such as lifting heavy weights or pushing down during childbirth (McCoy and Halstead, 2004, p107).

In the above functions the vocal bands are either open, or closed. It is in producing voice that the vocal bands vibrate. The sound we know as 'Voice' is produced by air from the lungs flowing over the vocal bands (cords / folds) when the glottis is not fully open and making them vibrate.

In order to understand how this works we can look at a popular current theory of the manner in which voice is produced, called the MYOELASTIC--AERODYNAMIC THEORY, which is based on the Bernoulli effect, whereby the flow of air through the vocal bands creates a suction that draws them together again (Wolfe, Garnier & Smith, 2009, p9).

Myo… refers to the muscle. The term **elastic** refers to movement. **Aero** means 'of the air' and **dynamic** refers to the force used in the process.

In summary (based on Wolfe, et al. 2009, and McCoy & Halstead, 2004, p110-113), the process works as follows: when you want to speak, the brain stimulates the 10th cranial nerve (the VAGUS NERVE), which innervates the vocal process through one of its branches, the LARYNGEAL NERVE. (To *innervat*e is to stimulate the action of a muscle through a nerve.) In voiced sounds the vocal folds are held together by the muscles until the air pressure of the exhaled air is equal to the pressure of the muscles holding the vocal folds together. The folds are then forced open (abducted) and the air forces its way past. The air pressure is now reduced (Venturi effect), so the folds can return to their original position through the application of both the Bernoulli Effect, and the inertia of the mass of the vocal bands themselves, as well

as the inertia of the airflow, which continues, until the build-up of air pressure once again forces them apart. The opening and closing of the vocal bands is referred to as glottal stop and can at times be quite forceful, e.g. in a cough. ·In normal speech the vocal bands are more gently closed so that the air pressure can force them apart without too much force. Sound is produced due to the changes in air pressure as the vocal bands move in this cycle. This can be repeated as much as 800 times a second, and is known as the vibration of the vocal folds. As the hundreds of glottal stops run into each other and combine, the ensuing sound is somewhat like a muted musical note. This sound is carried on the column of air coming through the glottis, which has by now also been set into vibration by the vibration of the vocal bands.

This theory therefore relates the ***movement*** of the ***muscles*** to the ***force*** of the column of ***air*** *that* is exhaled.

When whispering, the glottis is partially closed. This also happens for the sound "H", when air is expelled with energy to produce the sound. More air pressure is required to force the vocal bands apart in these instances.

The type of sound produced, in other words the tone, pitch, etc. of the sound, depends on the amplitude and frequency of the vibration and these are influenced by various factors involving the vocal bands. The physical structure of the vocal bands is important and this varies from person to person.

The **length** of the vocal bands affects the frequency – which the ear hears as pitch. The longer the vocal bands, the lower the note. The average length of the vocal bands in an adult man is 23mm and in a woman, 18mm (McCoy and Halstead, 2004, p107), hence the relative difference in the pitch of the voice. The average length of a person’s vocal bands may be shortened by the action of the muscles in the main

body of the vocal bands themselves, the thyro-aretenoid muscles, and this and this can raise the pitch of the voice.

The **thickness (mass**) of the muscular tissue of the vocal bands also affects the rate of vibration. The more mass, i.e. the thicker the vocal bands, the lower the note will be.

Frequency is also determined by the **degree of tension** of the vibrator. The basic theory is that the more tension in the vocal bands, the higher will be the voice. In physical terms this means that if the cords are tight, they will return to their position of inertia more quickly and be forced apart again sooner. Thus the rate of vibration within a certain period will be faster, i.e. the frequency of vibration will be higher and this will be heard as a higher note. The rate of vibration (or frequency) of an average man's vocal cords is 100-150 times per second, and that of an average woman 200 to 325 cps (cycles per second) (Washington Voice Consortium, 2014).

According to both Gray and Wise (1959, p178-181) and Anderson (1977, p452) this is somewhat more complicated than would seem at first because of the complexity of the muscle and cartilage interaction. At times when the vocal bands are stretched taut (giving a higher pitch), they must also be lengthened in order to stretch (which has the effect of lowering the pitch) or thicken (with the same effect). Thus the strength of the tightening of the bands has to be sufficient to counter the pitch lowering effects of the concomitant lengthening and/or thickening of the bands.

Further influences on the rate of vibration are offered by intra-tracheal air pressures, according to experiments by Sir V Negus and professor S Jones (Gray and Wise, 1959, p181-182). In both normal speech and singing, a fine balance is necessary

between the vocal bands and the muscles of the trachea, neck, abdomen and thorax in order to control pitch when increasing and decreasing intensity (or loudness).

The range of the voice in terms of pitch is affected by the **elasticity** of the vocal bands. The more elastic the vocal bands are, the more able they are to lengthen and shorten, increase and decrease their mass, and alter their tautness. All these will have a bearing on pitch, and thus the more variation the bands are able to assume, the greater the range of frequencies of vibration available to the voice (Rodenburg, 1998, p97-99). Singers and actors will engage in exercises which increase the elasticity of the vocal bands in order to extend the range of their voices and have more control over this range. It is important not only to extend the range but to achieve a smooth control over it, without the voice finding notes that 'crack' or disappear due to problems with the muscle control .

The loudness of the voice, or amplitude, relies on **air pressure from the lungs**, which determines the size of the puff of air released at each vibration of the vocal cords. This air pressure is controlled by the abdominal muscles, diaphragm and thoracic muscles. As has been mentioned, interaction between these muscles and the muscles within the larynx is necessary to control the frequency of vibration when the pressure of air within the larynx is sufficient to affect the frequency (McCoy & Halstead, 2004, p110-113).

When one is speaking or singing it is seldom that one would consider all these factors in the act of pitching one's voice. Very often the pitch of the voice is a reflection of mood and happens spontaneously. In singing the pitch is calculated, but in general the singer would just think of the note required and the body would adjust the muscles accordingly.

The action of the vocal bands in producing voice is what is currently in acoustic studies regarded as the **Source** of the sound in the Source-Filter theory of speech production. This is a theory that is currently at the forefront of speech and voice analysis as it allows for both acoustic analysis of voice and speech and also of the digital or electronic reproduction of speech (Cassidy, 2002, Kent, 1993, Wolfe, 2005., Wolfe et al. 2009).

In the production of voiced sound (i.e. the vowel sounds and nasal consonants) through the vocal bands, the vibration of the vocal bands is the **source** of the sound. Humans produce other sounds in their speech, which could also be considered the 'voice' of the human race even though these sounds are not necessarily voiced through the vocal bands. They include what are sometimes regarded as the 'noise' sounds of human speech, the fricative consonants, where the source is the part of the vocal tract that is hindering the air flow enough to cause friction. These sounds may involve vocalisation from the vocal bands as well (e.g. V, Z, ZH) for may be 'voiceless' (e.g. F, S, SH) With voiceless sounds the vibrations 'are caused by turbulent airflow due to a constriction in the vocal tract' (Cassidy, 2002, p2). A third 'source' of human communicative sound may be what Kent calls the 'release burst of stop consonants' (1993, p2), also known as plosive consonants (P, B, T.D, K, G). Some of these, as with the fricative sounds, involve the vibration of the vocal bands in their production (B, D, G) while others are 'voiceless' (P, T, K). These speech sounds are all audible. They also use vibrations of a different kind. Sound waves are stimulated and the sounds produced all have pitch and amplitude. i.e. they have measurable acoustic properties.

Kent (1993) has a very clear exposition of the source filter concept, showing that it 'proposes that acoustic energy generated by a sound source is passed through a

frequency-dependent transmission system". This transmission system is the 'filter' and is the system that gives us what we commonly know as Resonance as well as the articulation of sounds.

6.4 Resonance

In vocal production the basic tone produced by the vocal bands in the Larynx, called the Basic Laryngeal Tone, needs to be a bit more audible to be of any use in communication. The vocal apparatus provides a means of doing this through the process of resonance. In simplified terms with regard to voice, **resonance** can be considered the 're-sounding' or amplification (enlargement) and modification of the basic tone produced in the Larynx. Various physical factors are involved in the process and different aspects of vibration are used in different areas of the vocal apparatus.

The periodic vibration of the vocal bands produces a sound wave that has not only the fundamental frequency, or pitch, of the sound, but will also have harmonic overtones. In other words each sound produced by the vocal bands will have more than one frequency. This happens in all voice and is not limited to the practice of Overtone singing.

To clarify this we shall look at the basics of harmonics or Overtones as summarised from the World Book Encyclopaedia, Vol. 9, p 63., Menon et al, 2001 and Shaku Design,2008. In ordinary voice production overtones or harmonics are the different parts of a musical tone. The initial tone, known as the fundamental or first harmonic is the lowest tone produced by the entire vibrating structure. The overtones are

produced by vibrating segments of the original vibrating entity, beginning at an octave higher than the fundamental, and increasing in frequency to produce variations on the initial tone while the initial tone is produced. The higher frequencies or overtones are generally less intense in volume (amplitude) than the lower tones so the overall result is heard as one tone with a quality known as **timbre**. Different musical instruments will have different harmonics and thus different timbre, giving us the different quality of sound distinctive to each musical instrument. The vocal tract, as a musical instrument, has harmonics that change according to the shape of the 'filter' and this shape is determined by the vowel sounds produced, as each vowel sound is created through a differently shaped vocal tract. An important fact to be aware of in this formation of the vowel sounds is that the vibration under consideration is not only that of the vocal bands but of the entire resonating chamber. The vowels can be heard to have different resonant pitches even when whispered (Turner, pp34-38 & Colson pp34-37), which shows that the vibration of the vocal bands, and the pitch defined by these, can be a separate consideration from the pitch determined by the shape of the resonator. The vowel resonator scales shown by Turner (p35-37) and Colson (p37) have been a commonly accepted measure of the different frequencies, with awareness that each individual may have personal differences in pitch due to the individual size and shape of personal resonators. This awareness of the importance of the shape of the resonator area, the 'filter', as opposed to the tension of the source, the vocal bands, in defining pitch is important not only in the investigation of Bi-phonic singing but in all training of the speaking and singing voice

Resonance can operate through *sympathetic vibration* in the resonators, or hollow cavities, at the front of the mouth and face. This form of resonance is called *cavity*

resonance. (Anderson, 1977, p459, Gray & Wise, p93). That initial sound vibration sets the air in the mouth and pharynx spaces vibrating as well, hence the appellation *sympathetic vibration.* A resonant voice is like a correctly tightened drum and has a resounding quality. As the sound waves of the original tone move through the tube cavity of the Pharynx and are collected in the frontal cavities, the changing vibrations cause the tone to '**re**-sound' over and over and it develops overtones which make the sound fuller and richer, adding to the quality of the voice. These overtones are dictated by the shape and size of the resonator.

When considering *cavity vibration,* it is generally acknowledged that *t*here are 3 main resonating cavities, the ***Pharynx***, the ***Nose*** and the ***Mouth (***Figure 6.9***)***.

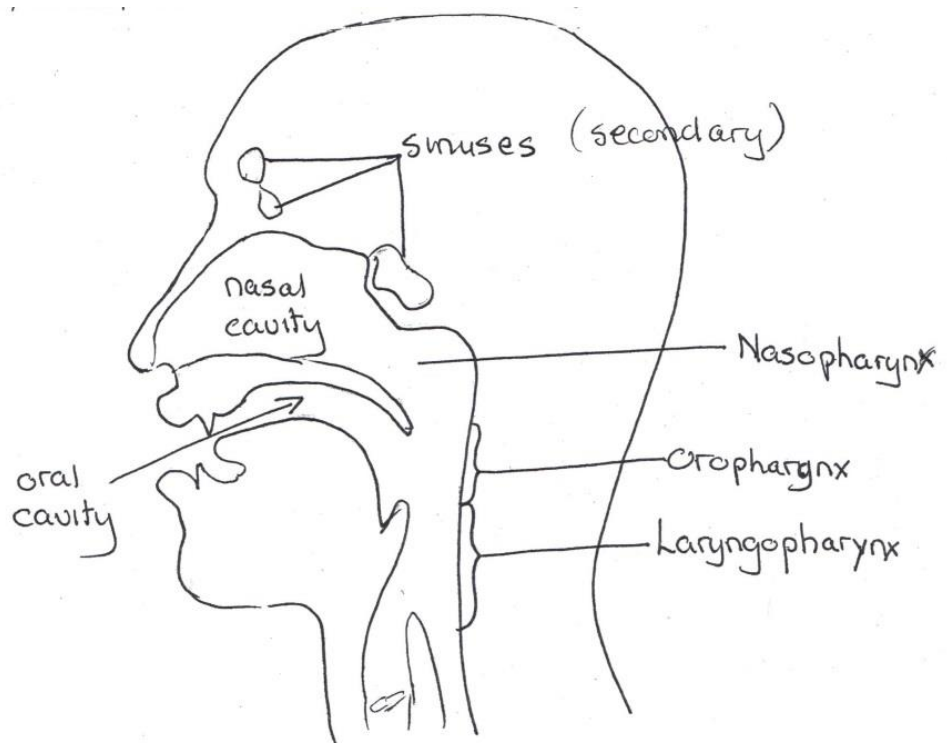


Figure 6.9 The basic areas of resonance (Own composite after Colson, Eisenson.)

Secondary resonance may also take place in the sinuses, the chest, and in fact, throughout the entire body. McCoy, for instance, suggests that the laryngeal ventricles, between the vocal bands and the ventricular folds may act as a small resonator. He also shows that the trachea below the vocal bands may also perform as a resonator, although, being fixed in dimension and structure, it cannot offer any tuning of the base note (McCoy and Halstead, 2004, p119). Later on he shows how the position of the larynx can affect the resonance and pitch of a singer's voice (p124-129) as it can alter the dimensions of the pharynx.

The quality and amount of the resonance produced in these areas is affected by

a) the ***size*** and ***shape*** of the ***resonator***---The larger the resonator, the more resonation of the fundamental tone and the lower overtones. The smaller the cavity, the higher the tone will be (Turner, 1977, p28).

b) the ***size of its opening to the air*****-**---the larger the openings the higher the frequency.(Sundberg 1997, p301) If the words 'Wow" or "How", are whispered and vocalised, opening the mouth wider each time it will become apparent that the 'own' sound rises in pitch.

c) The ***surface texture of the resonator***--sound resonated off hard surfaces is harsher than that reverberating off soft, cushioned surfaces, which dampen unpleasant sounds. Therefore tension in resonating cavities will result in rigid, hard chamber walls, giving a harsher sound than relaxed resonating cavities.

The Resonators in Detail

PHARYNX

The **PHARYNX** is the back of the throat, extending for about 13 cm from just above the Larynx. It can be divided into 3 sections, which can be used together or paired in different ways for different effects (Eisenson, 1979, p26-27):

1. The **LARYNGOPHARYNX**, which is just above the Larynx (Oldham, 1994). This is the area where the sound is first resonated immediately on production, when the tone is strongest. This area of the throat is muscular and can be constricted, widened, tensed and relaxed (Eisenson, 1979, p27)

2. The **OROPHARYNX,** which is above the Laryngopharynx and behind the Mouth Cavity (Oldham, 1994). The oropharynx can be paired with the Laryngopharynx by raising the uvula to shut off the nasal cavity, thereby changing the size of the resonating chambers as well as the openings (Eisenson, 1979, p27) (Oldham, 1994).

3. The **NASOPHARYNX**, which is behind the Nasal Cavity (Oldham, 1994). When the uvula is lowered, this area can be used in conjunction with the lower part of the pharyngeal tract. When the uvula is raised (as for vowel sounds) this area is shut off from the lower pharyngeal tract and is coupled with the nasal passages and resonance in the nasal passages can then only be effected through the vibrating sounding board of the roof of the mouth, which changes the quality of the resonance (Eisenson, 1979, 26-27) (Oldham, 1994).

The tone of the voice depends very much on the size, shape and TENSION of the entire PHARYNX. If the Pharyngeal walls are ***tense***, the voice will be strained, thin and high pitched, giving a strident tone as it is projected. If the Pharyngeal walls are

too lax, there will not be enough resonance in the Pharynx itself and the voice tone will be very throaty. Laxness of the Laryngeal muscles may often go with a lazy tongue where the muscles are also lax as it does not move enough. Such interdependence of the muscles can aid trainers who would give exercises to make the tongue more active, which will often serve to bring the voice forward out of the throat.

Newham works extensively with the tube cavity of the Pharynx following Grotowski's concept of 'opening the throat'. He focuses on opening the pharynx, using exercises to open the 'tube' and extend it by lowering the larynx (Newham, 1999) This practice is used by trained singers to improve the timbre of the voice by lowering the formant frequencies through increasing the size of the resonator and thus giving a rounder tone. A different resonant effect can be achieved by elevating the larynx and reducing the resonating area at the back of the throat to achieve a brighter, more nasal sound for the 'belting' voice so popular in modern musicals. It is sometimes felt by experts that too much changing of the natural position of the larynx contributes to tension in both the extrinsic and intrinsic muscles of the Larynx and can lead not only to vocal strain, but to possible damage, especially in the case of the raising of the larynx (McCoy & Halstead, 2004, p129).

THE MOUTH

The mouth cavity can have great variation in size and shape, depending on the position and activity of the various organs of articulation. It is bounded in front by the teeth and lips and at the top by the hard palate which becomes the soft palate or VELUM towards the anterior. The Velum, ending in the UVULA, is muscular and can

be raised or lowered to meet the back of the tongue. The TONGUE forms the floor of the mouth. It is extremely flexible and very active in articulating sounds. The mouth is bounded in front by the LIPS, which also affect resonance by their movement.

Oral resonance, being in a large cavity, can amplify the lower overtones, giving the voice a fuller, more resonant and mature sound. Inadequate Oral resonance, caused mainly by insufficient resonating space in the mouth, generally results in a thin, reedy, childish vocal tone. It can also exacerbate throatiness, stridency and nasality. It is relatively easy to improve resonance in the Oral Cavity by learning to relax and lower the jaw for vowel sounds, thereby enlarging the resonating chamber. Making the Velum more muscular by exercising it can also result in a larger oral and pharyngeal space as it opens more to give an ‘open’ throat.

THE NOSE

The Nasal Cavity, unlike the Mouth and Pharynx, is fixed in size and shape. It is divided into 2 sections; Left and Right, by a bone called the Septum and is separated from the Oral Cavity by the bony Hard Palate. Nasal resonance can happen in two ways.

a) The soft palate (Velum) with the Uvula at the end can be lowered, preventing air from entering the mouth cavity, and forcing it to travel through the Naso-Pharynx and into the nose and resonate in this cavity. This happens in the nasal sounds *MMM, NNN*, and *NG*.

b) If the voice hits the hard palate well, (i.e. if the position of all the articulatory organs is correct) the sound waves can penetrate it to cause sympathetic vibration in the Nasal Cavity.

Nasal Resonance is essential to good voice quality. Without it the voice is dull and muffled. When the Nasal passages are blocked, the voice loses its Nasal resonance and becomes distorted. In fact, the Nasal sounds cannot be articulated properly and have to be substituted with plosives formed by the mouth. MM becomes B --NNN becomes D and NG becomes G.

If the voice sounds too nasal, this is usually caused by allowing the Soft Palate to remain lowered (as for MM, NNN and NG) even in the production of other sounds which should be pronounced with the Velum raised, When this happens in words containing MM, NNN and NG, (i.e. the Nasal resonance is applied to the sounds surrounding the Nasal sounds) the fault is called Assimilation Nasality. When the fault happens regardless of whether there are Nasal Sounds in the word, the terminology for the fault is Hyper-nasality. When this is combined with tension in the Pharyngeal wall, the voice takes on a tight Nasal "Twang" in addition to the excessive Nasality. Vowel sounds in standard English should never be subjected to this excess of Nasal Resonance unless playing a character part such as the Nanny from the Bronx in the TV series of the same name or the cockney lass, Eliza Doolittle, in Bernard Shaw's 'Pygmalion'. Other languages use nasality of some vowel sounds and therefore knowledge of how to increase or decrease nasality can be useful for actors playing roles that demand an accent. One can test for Nasality of sounds by placing the fingers on the nose when making the sounds. The nose itself should only vibrate for MMM, NNN and NG.

We must not forget the other aspect of resonance that is important in the body. The bony structures of the body provide *sounding board* resonance where the vibrations of the voice are transferred to the bone, which vibrates in tune with the original tone although not necessarily at the same frequency. There is some discrepancy in attitude regarding the efficacy of forced or sounding board resonance with regard to voice. Anderson feels that what is generally termed the 'sympathetic' resonance found in the oral, pharyngeal and nasal areas is merely examples of forced vibration (Anderson, 1977, p 457-459). Lessac believes that vocal resonance happens through the bony structures of the body and that the primary resonating areas are not the spaces but 'the teeth, hard palate, nasal bone, cheekbones, sinus bones, forehead and cranium' (Lessac, 1997, p13). According to him, resonance is a combination of sympathetic resonance and forced resonance, in that the sound waves from the vocal bands are given sympathetic resonance when they hit the hard palate and the teeth, and this causes forced, or sounding board resonance in the nasal bones, the sinuses and the cranium, which in turn pass the vibrations directly to other bony areas of the body. His theory is that the spaces in the cavities mentioned above provide 'wave reflections' which give the voice the overtones and timbre usually associated with resonance, while the 'sounding board' gives power to the voice (Lessac, 1997, p13). This could relate to Grotowski's view that 'the number of resonators is practically unlimited. He (the actor) can exploit not only his head and chest, but also the back of his head, his nose, his teeth, his larynx, his belly, his spine as well as ….the whole body' (Grotowski, 1967, p36). If the sounding board resonance postulated by Lessac is passed to through the bones, then, indeed, the vibrations could travel through the body via all the linked bony structures.

SECONDARY RESONATORS

The sinuses and the chest are more safely regarded as *sounding boards* rather than direct Resonators, as there is still controversy as to their functions. As such they improve the quality of the tone of the Voice.

The four pairs of **SINUSES** are hollows in the bones in the head, around the eyes, nose and cheekbones, functioning mainly to make the head structure lighter. They may contain air but serve mainly as drainage areas. When they are clear of liquid, sound that travels through the bones of the face can cause the sinuses to vibrate as sounding boards. The vibrations of resonance cannot be controlled in the sinuses as the openings and tension cannot be modified and for this reason they are not regarded as primary resonators. It is evident that they do, however, contribute to the tone of the voice because if they become blocked with mucus the tone of the voice is deadened and muffled.

CHEST CAVITY (THORAX) This is mainly filled with the spongy tissue of the lungs therefore there is no space for resonation. However vibrations CAN pass along bones (Ribs and Sternum) to help amplify sound and this is what people often call ‘Chest resonance. In this way resonation can spread over the entire body even reaching the feet.

It is essential to balance the resonation between the pharynx, nose and mouth. No one resonator should take precedence over the others.

Well resonated vocal tone relies on the co-ordinated interaction of all the resonating cavities, combined with the size of the oral opening and the shape of the oral cavity depending on the sound produced.

6.5 Hearing

The sound we produce as ‘voice’ is thus seen as vibration in varying forms. In order for the sound to be of use in communication, it needs to be heard and the way we hear our own voices could impact on the vocal production so, once again, we look at vibration. Dame Evelyn Glennie, the lauded deaf percussionist, explains hearing very simply and succinctly, “Sound is simply vibrating air which the ear picks up and converts to electrical signals, which are then interpreted by the brain” (Glennie, 1993, p 01) Looked at in more detail, the process is that vibrating air, which is sound, enters the outer ear and is funnelled inwards by the shape of the ear. When the sound wave reaches the ear drum, a membrane dividing the outer ear from the middle ear, it sets the eardrum vibrating. This vibration sets 3 small bones in the middle ear, the hammer, anvil and stirrup, moving in turn, and the stirrup transfers the vibration to the cochlea, a fluid filled snail-shell shaped part of the inner ear. The cochlea is filled with tiny hairs which transfer the vibrations into electrical signals. These signals are sent to the brain to be translated as the sounds we ‘hear’ (Kenny, 2012, p1).

While this is the clinical description of how one hears with the ear, Dame Evelyn Glennie theorises that ‘hearing' a sound and ‘feeling the vibration’ of a sound in other parts of the body can, to some extent, fulfil the same function. She postulates that hearing is similar to touch and this is borne out by Verillo who states that “both hearing and touch systems are activated by the mechanical displacement of sensory receptors by energy from the environment” (Verillo, 1992, p1). The body becomes a receiver of the vibrations and different parts of the body seem to respond to different pitches of sound, especially to lower pitched sounds. According to the inventors of a hearing aid device attached to the tooth, sound vibrations are conducted through the

sounding boards of bony structures of the body whether they are initially heard by the ear or not. Thus conducting the sound to the inner ear via the bony structures of the head is an alternative method of providing a hearing experience. It follows then that vibrations felt by the skin will also transfer themselves to the bony structures of the body and thus provide a 'hearing' experience. The inventors of a 'haptic chair' have developed this concept to the extent where the chair will receive the auditory input , and through specially designed speakers, transfer the vibrations to the body of a seated person where sound will be experienced through bone conduction (Taylor, et al. 2011).

This form of 'hearing' could be important in the tuning of the voice in that singers, who need to tune themselves carefully to hit the notes true, could possibly use a bodily awareness of the vibrations of a notes as well as an aural awareness. Opera singers are reputed to prefer not to sing on a carpeted floor, as it interferes with the vibrations felt through the floor, which help with tuning. Although Sundberg shows that the ear is not absolutely reliable in tuning the voice as the sound it hears is altered by the acoustics of the room (Sundberg 1992, p362), he also reveals that skin cannot be absolutely reliable in sensing high pitched sounds and that the sternum vibrations are mainly useful in sensing lower pitched sounds. Vocal tract vibrations reflect onto these areas but the 'tuning' that singers do cannot be reliably placed on these vibrations, and yet the vibrations in the vocal tract do not only form the sound and cause resonance but also provide a form of 'tuning,' in other words a feeling akin to hearing that enables tuning. He postulates that there may "perhaps (be) physical correlates of placement other than perceptible vibrations" and that "the very high pressure oscillations in the body tissues [may] affect blood circulation in such a way that the effect can be termed "placing" (Sundberg, 1992, p380).

The idea that sound affects the very cells of the body is commonly accepted among the sound healing fraternity, and the relaxing effects of sound vibration, such as found in the use of Tibetan singing bowls, Ting Shas and gongs, are used in their therapy, It is possible then that the sound we produce ourselves as voice can not only be tuned through the resonances produced as well as the sound we hear externally, but that the sound we produce could have a resonant, relaxing effect upon the muscles of body. Overtone chanting is reputed in western sound healing practices to be therapeutic. This could be because of the meditative state that is induced but there is also the possibility that the sounds generated by the chanter may have a relaxing effect on the chanter's muscles. This may indicate that using Overtone singing and chanting for vocal training could help to relax muscles that are tight and create blocks to vocal production (Stacy et al. 2002).

SECTION 3 ***BI-PHONIC VOICE***

Chapter 7 ABOUT BI-PHONIC VOICE

7.1 General overview

Bi-phonic singing, as the name implies, uses, in its simplest description 2 (or more) seemingly different sounds, a lower register, drone- like sound and another higher sound that can at times resemble the noise of a flute or of birds singing. This higher sound will change during the singing thus giving different and separate overtones to the basic drone or 'fundamental' sound.

The practice of producing extra tones (overtones) that are quite distinct from the underlying tone has given the practice of Bi-phonic singing an alternative name of 'overtone' singing. The process of investigating the practice of Overtone or Bi-phonic voice production is more complex than one would initially think. This is because there are various schools of Bi-phonic vocal production, linked to the cultural usage thereof.

7.2 Background, history and development

Much of the practice of Bi-phonic singing hails from the areas in and around Mongolia and Siberia. The common alternative term to Bi-phonic singing, which is 'throat singing' has its origin in the Mongolian word for Throat or pharynx, which is often translated as 'xoomi' (Pegg, Levin) or hoomii (Levin, 2006), khoomii (Bosson 1964) or Khoomei (Foresman 2008 & other internet and YouTube sources). The pronunciation of the terminology is such that the 'x' or 'Kh' in the first term would be

pronounced as the ‘ch’ in the Scottish word ‘loch.’ **(/x/** in IPA script) The appellation ‘Throat singing’ may seem strange as all singing arises in the larynx, which is in the throat. However the description of the vocalisation refers to the fact that the throat is consciously constricted more than it is in normal speaking and singing, to give the particular quality to the voice.

The traditional life of people in these areas revolved around a nomadic pasturalist life, following herds from summer grazing to winter pasturage, from the high Altai mountains in the Altai republic bordering Mongolia to the plains (also high) around Tuva in Southern Siberia. Because of the nomadic way of life, modern political borders for countries are not an effective demarcation for the areas in which the Bi-phonic singing traditionally originated and thus the wider area outlined above will be considered. The singing practices of these areas are believed to have roots in old animistic and shamanistic beliefs that are closely linked to the terrain and the pastoralist way of life. The use of the voice as an instrument that creates the sounds of different instruments could also have its origin in the nomadic way of life, where it is not possible to carry and play an instrument riding all day on horseback, tending herds, so the voice substitutes for the instruments. Not all singing practices from these areas use only Bi-phonic voice and it seems that the vocal usage is rooted in the function of the songs.

According to Pegg (1995) the singing of heroic epic songs by bards, a practice which was almost destroyed during the communist regime, leaving very few singers to carry on the tradition, has strong links to shamanism. “Epic performance was used both to please and to exorcise spirits, to cure illness and infertility, and bring success in hunting or war “(Pegg, 1995, p83-84.) The act of performance, the timing of performances, exact wording, rituals observed during performance and even the

clothing and instruments used could have influence on the ancient shamanistic spirits. The declamatory style of delivery of these epics , called ‘Haila’ (Pegg,1995) or ‘xailax’ (Pegg 1992) uses a deep voice without melody, that is related to throat singing, with women being barred from usage of this tone as it required ‘a forceful flow of air from deep in the chest,….. (and) great strength “(Pegg, 1995, p 85).

The actual Bi-phonic singing from these areas has different forms and, apart from the meditative chanting by Buddhist lamas, often has a more secular function than the epic poetry of Mongolia, ranging from lulling a baby to sleep to entertainment or to calling the herds in from the mountains. The usefulness of a vocal sound that could carry for up to 3 km in order to call a herd of yaks in from pasture (Pegg, 1992, 36) could be inestimable. Much of Khoomei seems to have its roots in animism and sympathetic magic, with multiple functions in this area. It could be used for copying and thus, through mimesis, harnessing the power of the sounds of nature, from the sounds of the winds in the mountains to the sounds of the birds which represented long life. It could be used to make offerings of sound to the spirits residing in the rivers, streams and mountains, Offerings could be made in many forms such as white cloths tied to trees or food offerings, but a vocal offering, mimicking or capturing the mood of the sounds of the natural phenomena was assumed to be highly fitting in pleasing the spirits (Levin, 2006, p200-201).

The practice has possibly been documented from the 16th century, although its secular use declined under disapproval from the lamas and it was not until the 20th century that it has a resurgence of popularity as a performative art (Pegg, 1992, 36-41). During the years of communist rule in the USSR the authorities tried to change the ethos of the practice, to do away with shamanism and animism as belief systems (to the extent of killing the shamans) and to align the traditional singing styles with

more European styles of singing, so that early ethnographers found it difficult to document the singing style. However, with the fall of the Communist regime traditional singing has had a resurgence of popularity and has, since the 1980s been exported to the West, where the fear of musicologists is that the practice will become so performance orientated that it will lose its roots in nature and that therefore some of the infinite variety of tonal timbre may eventually be lost (Levin, 2006).

7.3 Vocal production of throat singing

In the production of throat singing the initial sound, as with normal speaking or singing voice, is produced in the larynx by the vocal bands. This is the source. This initial tone, amplified through the lower filter, the 'tube' resonance, is held as the 'drone' sound while the overtones (which may or may not be harmonics of the fundamental) are produced within the 'filter' area of the pharynx and mouth, with the tongue and lips being very active in changing the shape of the resonator. There is an alteration in the way the sound is initially produced as the singer will constrict the throat in varying degrees and positions, to ensure that the vocal bands are shut for longer and open for less time in the vibrational cycle. This will allow the overtones to be more powerful because the resonance in kept in the tube above the vocal bands (Levin & Egerton, 1999, p3). In normal speech and singing the overtones, or formants, are there, but the fundamental note is the stronger one and thus the overtones are not heard individually but contribute to the timbre of the voice. In Khoomei, due to the throat constriction causing the vocal bands to remain in the closed position for a longer period, and thus for the overtone to become stronger, the effect is of 2 distinct notes being produced, when in effect they are two aspects of the same note. Sound produced with a constricted throat is termed a 'pressed' type of

voice, and is also common in some Asian languages which are more tonal than western languages.

There are different forms of Khoomei (throat singing), with some practitioners claiming to sing six different forms. According to Forseman (2008) there are 3 basic forms where the mechanics alter slightly, with the other forms comprising mainly embellishments on these forms. Each form will have slightly different ways of using the tension of the throat muscles as well as specific alterations of the filter area. The 3 main forms of Khoomeii are:

- The basic form which is also known as ***Khoomei***, where the singer uses a middle range for the basic drone sound and the throat is only moderately constricted in the larynx area, fairly low in the throat. The upper throat area needs to be more open and less tense. The tongue is not very high in the mouth and the overtones are isolated with the back of the tongue (Yahoo group). Through high speed digital imagery, Sakakibara has found that there is possible False Vocal Fold vibration in the production of this drone sound even though it may sound like a basic tone (Sakikabara, 2006, p2). The tongue is raised and lowered in the oral cavity, while the lips and even inner parts of the throat may move to produce a range of harmonics, with one being stronger, to hold a tune.
- A higher range of sounds is produced with the **S*ygyt*** style. Here the throat is far more constricted than for Khoomei, and the tongue clings to the teeth ridge (position for ‘L’). The air flows with great pressure round the back molars either on the left or right side towards the front of the mouth where the lips shape the formant (basically an *ee sound)* into a whistle or flute- like sound

that is reminiscent of a bird calling. The basic drone sound is more muted in *Sygit* with the overtones, formed by shaping the back of the tongue, being more prominent. .

- The third**, K*argyraa*** style is recognised by its deep growling sound which, to many listeners, is somewhat similar to extreme Vocal Fry, although the physiological production is said to be different. According to Sakakibara et al (2004,p4) Vocal Fry is produced by the vocal folds themselves while in *Kargyraa,* the vocal folds produce the basic drone and the sub-harmonics are brought into play by the ventricular folds (false vocal folds), which are brought into vibration by constriction of the larynx through tightening the upper throat. These false vocal bands are not particularly muscular in themselves, having not enough thyro-aretenoid muscle fibres in them for complex vibratory activity, and only oscillate at half the frequency of the vocal bands, thus giving a second drone sound an octave below that of the vocal bands. Further harmonics in the upper range may be generated on these sounds by shaping the mouth into vowel formations. It had been found that some skilled singers in this style, through extreme control of the upper throat muscles and their effect on the intrinsic muscles of the larynx, can also generate sub harmonics at a third of the vibrational rate of the vocal bands giving a variation on the sub harmonic range. It is this K*argyraa* style that is most closely related to the chanting of the Tibetan monks

These basic styles can also use special effects such as quivering the lips to create a trilling sound, or combining *Kargyraa* with *Sygit* or using rhythms to create special effects.

Tibetan chant, with a sound similar to Kargyraa, is sung by the Buddhist monks from Tibet and has spread to the western world due to evacuation of some monasteries as a result of the Chinese invasion of Tibet and persecution of the monks. This form of chanting probably developed from the ancient animistic Bon practices when the Buddhist Lamas travelled to Tuva and Mongolia to spread Buddhism. The romantic story about its origin is that a monk was 'given' the chant in a dream and when he woke was able to do it so he taught it to others in the monastery and it has remained with them ever since (Goldman, 2002).

This form of chanting has captured the imagination of the west because, while it remains constant, it seems to use 3 different notes at the same time so the monk is chanting a chord. Although it's base note is very low it differs from Kargyraa in that it uses words. It is thought that in vocal production this chant may also use the aryepiglottic folds (Sakakibara, 2004), thus giving a different range of sub-harmonics and it is possibly this practice that gives the 3-note chord sometimes heard in Tibetan chant.

The Mongolian traditionalists believe that Khoomei should only be performed by those strong enough to withstand the demands upon the body. According to tradition a Khoomei singer needs to have the strength of a wrestler at his peak or resulting damage to the larynx and even broken blood vessels in the face may occur due to the effort required, while regular use of Khoomei may change the quality of a singing voice. Women were traditionally discouraged from performing Khoomei, especially after marriage. It was traditionally believed that singing in the Khoomei styles caused infertility in women. It was also felt that the practice detracted from a woman's beauty due to extreme contractions of the facial muscles and that the sounds were not natural for a woman to make (Levin, 2006, p199). Based on this research among

traditionalists, Pegg, in 1992, advised care in the use of Overtone singing in the Western world until medical findings could prove these restrictions groundless. Current opinion seems to be that the practice is not harmful and Sakikabura states that “throat singers are able to keep healthy, clear, and beautiful voices though they use pressed-type voices” and “the phonation of throat singing is natural and not mysterious” (2002, p2). Grover (2003) states that throat singing is not damaging when correctly done, but that strain of the vocal apparatus could occur in the learning process, and advises practice at low volume, with breaks every time the throat feels sore. Levin shows that women in the Tuva area are breaking away from tradition, and that throat singing clearly does not make all women infertile, as one of the singers interviewed managed to easily bear a child after marriage with no ill consequences (Levin, 2006, p 205). Converse to the traditional belief, we find that there is also a perception among those who use overtone chanting for healing purposes that it is natural and relaxing. It would, however, seem that the overtone chanting generally advocated in sound healing practice is the less physically stressful one of khoomei (Perry,2007) (Nielson,2000) or Western overtone chanting.

Overtone singing is not limited to the Eastern areas of Europe. In Northern America the Inuit tribes use a variation on throat singing as a form of singing game called Katajjait. This game is traditionally performed by women and involves 2 women ‘singing’ and panting together. One will sing a motif which will be repeated by the other while the first is already singing the second motif. Thus the sound heard will constantly have 2 different tones in it. The women have their mouths very close together and almost seem to use each other’s mouths as extra resonating chambers, thus creating interesting overtones. The game is very strenuous in terms of breath control and the woman who cannot keep up with the breath demands or who fails to

keep up with her partner is the one who loses the game. Many different sounds and motifs are used in this game including sounds of nature and animal and bird sounds. It is postulated by Nattiez, among other anthroplogists, that, although now seemingly being used mainly for entertainment, this practice could have originated in shamanistic times as a form of influence on nature, either hastening the return of migratory geese (by imitating their sounds) to herald spring and thus having an influence as a fertility rite, or assisting the men who were out hunting by simulation of animals and birds they might hunt, or elements of nature that might propitiate the hunt (Nattiez,1999, p 202-405).

In South Africa, the Xhosa women use a form of throat singing called **Umngqokolo**, or ‘eefing,’ where the deeper, gruff tone may be used in a percussive way with a tune emerging in the overtones. 3 different simultaneous tones have been noted by Dargie (1991) and it seems that it is the women of the tribe who sing in this way without fear of ill effect.

Overtone singing has also been noted in Japan among the Ainu people where the practice is referred to as **Rekutkar** and follows a similar pattern to the Inuit throat singing. The sounds produced are representative of the sounds of a bear which is sacrificed to return to the gods to tell them how well humans have treated it. This form of throat singing is close to extinct. This form of vocalisation, which differs from the Tuvan throat singing in that separate overtones are not produced although the voice is rooted in the throat area with throat constriction, has also been recorded among the Chukchi tribe in Siberia (Nattiez, 1999, p399-410).

There are various Western forms of Overtone singing including the A Tenore singing in Sardinia which is not considered entirely bi-phonic, as well as a western form of overtone chanting developed through the sound healing practices. This form of

chanting uses mainly the lips and the front of the tongue to create overtones that are not clearly separated from the fundamental. It is based on an *ee-uuu-eee-uuu* sound and does not involve the specific throat constriction or the Khoomii singing. Khoomei practitioners are somewhat scornful of this technique as the range of sounds within this form of overtoning is somewhat limited and it does not lend itself to much variation or creativity.

7.4 Different uses of vibration and vocal bands for different types of overtone chanting

Although the initial sound is produced by the vocal bands, the method of using these vocal bands is slightly different from ordinary speech as the pressed throat causes the vocal bands to hold together for a longer time. While there seems to be no absolute agreement among researchers as to whether the ventricular folds are used in *Khoome*i and *Sygyt*, and to what effect, they are clearly used in *Kargyraa* chanting and in Tibetan chant. In Tibetan chanting it would seem that it is not only the ventricular folds that vibrate an octave below the base tone, but that the aryepiglottic folds are also potentially called into use in a controlled way. This theory arises because Tibetan chant approached Growl voice, which clearly uses the aryepiglottic folds. These folds are not usually vibrated for speech unless the speaker has a speech problem, as it is thought they may be called into play during Vocal Fry. Sakakibura states however, that the sub-harmonics in Vocal Fry are created by the vocal folds themselves (2004, p4). In singing, these aryepiglottic folds, without being used in a vibratory way, are assumed to add to the resonance of the formant by making the tone brighter.

At an early stage in analysing throat singing it was postulated that there may be two sources for the sound, namely the vocal folds and the ventricular folds, but later research has seemed to indicate that the source is the vocal folds and the vibration on the ventricular folds or the aryepiglottic folds is part of the filter modification of the sound. Thus, in *Kargyraa* voice, the source note would be the fundamental produced by the vocal folds; the vibration of the ventricular folds would alter the shape of the filter in the laryngopharynx and create the sub-harmonic an octave below the base note, while the modification of the tongue and both the nasopharynx and oropharynx would further enhance the sound by increasing the amplitude of the upper harmonics.

While *Kargyraa* voice appears to bear some relation to the growl voice evinced in Extreme Metal singing such as Death Metal, due to the proven use of the ventricular folds and possible use of the aryepiglottic folds in producing this form of singing, there seem to be differences relating to the aspect of the purposely squeezed throat, which may have its roots on some aspects of Eastern language vowel sounds which also used pressed voice (a voice quality resulting from speaking with the vocal folds pressed tightly together with little air moving between them). Research into the growl phenomenon in metal singing is ongoing, partially due to the incidence of vocal strain shown by singers of this genre, and this research can benefit those interested in throat singing in terms of effect on the vocal folds. An interesting observation in analysing the production of both growl and scream voice in metal singing is that of looking at the position of the head while performing. The vibrations in the vocal tract are altered, not only by the raising and lowering of the larynx, but by the position of the head, with the lower notes being produced with a forward dipping of the head and the higher notes with the head in a more upward position to shorten the vocal tract.

(Smialek, et al.2012, p1). This awareness of alteration of timbre due to altering the length of the vocal tract through body shape is also extensively discussed by Newham, with a different purpose, that of using the voice thus produced in a therapeutic fashion, to release repressed emotion. The researchers in throat singing seem to have focused on the throat, position of larynx and action of the vocal, ventricular and aryepiglottic folds. It is possible that head position may have some impact on the final sound produced in forms of throat singing.

Chapter 8 QUESTIONNAIRES AND INTERVIEWS ON BI-PHONIC VOCAL PRACTICE

*8.*1 Questionnaires and Interviews in detail

The questionnaires were designed to reflect a response to the practice of Overtone singing and chanting in either the Tuvan or Tibetan style. Answers to questions would reveal vocal experience and both physical and emotional responses, either positive or negative, especially with regard to effect on vocal production. Because the investigation of the practice has to do with its potential in vocal training, a selection of subjects were chosen to reflect the effect of the practice on both trained and untrained voices, perceptions by teachers of the practice and those who regard themselves as students, people who have had instruction and those who are self-taught and learn by mimesis as the Tuvan singers do.

The search for people who practice overtone singing or chanting in South Africa turned out to be a difficult one. Although an internet search revealed an interest shown in other countries, it seems to be a practice that has not yet taken root in South Africa, thus limiting the number of interview subjects, with distance becoming a factor in the methods of conducting the interviews. It is possible that the lack of teachers of the practice in South Africa could be due to the fact that online instruction abounds on You-tube. A search on You-Tube revealed many videos of Tuvan style professional performers, groups such as Huun Huur Tu and individuals such as Rollin Rachele. There are also videos of ethnographical studies of both Tuvan and Tibetan style throat singing and chanting.as well as entire web sites devoted to Overtone singing, that give information, run blogs and give instruction on the practice. Many people offer instruction through You-Tube. These people range from

teenagers who seem to be sharing the practice with friends to sound healers, to recognised researchers in the subject, such as Tran Quang Hai. Thus it could be that more people in South Africa practice the singing through these training outlets but are not traceable. Such subjects would be of interest, as some You- tube 'teachers' revealed a disturbing lack of knowledge about the vocal apparatus in their 'lessons', and thus the potential for vocal damage could come, not from the practice itself but through poor teaching methods.

In selecting people to interview or fill in the questionnaires, some teachers of the practice were sought as it was felt that if they had enough experience to teach, they would therefore be well-practised in the art and would be able to report on it with authority. There seem to be currently only 2 practitioners in South Africa actually teaching the use of overtone singing , mainly as part of a sound healing practice, who could be used as interview subjects, and it would seem that interest in the practice seems to be so minimal that each has other more regular income streams than teaching Overtone singing. An acclaimed South African sound healer and teacher of Overtone singing, Nestor Kornblum, even relocated to Spain to conduct his practice, and only comes to South Africa infrequently. The search thus widened to include sound healers, who might use the practice without actually teaching it. Sound healing seems to be popular in South Africa as a type of therapy to help people relax, almost like a sonic massage, but most sound healers seem to limit their sound 'journeys' to the playing of Tibetan bowls, Ting Shas and gongs. Two sound healers were found who use the vocal practice for their own meditation with one using vocal toning for healing purposes. Through contacts in the music world, a further interview subject was found, who uses the practice for his own professional interest.

Because most of those interviewed were too far distant to conduct a face to face interview, in most cases interviews were conducted telephonically. Skype calls from my computer to the interview subjects' landlines were initially considered the ideal, as these would permit the recording of the interview. Skype to Skype was not possible because those interviewed did not have the computer resources to allow this. As it turned out, the time lag in a Skype call proved detrimental to the interview process, as it caused misunderstanding, and thus interviews were confined to telephone conversations, which could only be recorded through writing.

The interviews were conducted along the lines of the set questionnaire (Appendix A). Those interviewed first filled out the questionnaire and returned it to me, this process mainly taking place by email. This was followed by a telephonic interview if the subject was willing, which followed the topics in the questionnaire but allowed the subjects to elaborate on them, having thought about them a bit. Occasionally lack of computer access or expertise altered the process slightly.

The findings of these interviews are presented as follows.

The **first interview** was the only live interview, conducted with a practising sound healer, Ms Alice Hoeller at her home-based practice in Gauteng. Ms. Hoeller, a self-taught sound healer, conducts her practice through using Tibetan bowls, Ting-Shas and gongs. She follows the practices of Buddhism and thus meditates daily, incorporating chanting into a part of the meditation, but does not use this chanting in her healing process and would not chant as a demonstration, feeling that her chanting might not be 'correct.' Being dyslexic she preferred the vocal interview and was more expansive during this than on paper.

She uses the Tibetan monk style of chant and had not used the other forms of throat singing. Although her initial reaction to the chant was that it was disturbing and very foreign to her, with a harsh, ugly sound, it grew on her, especially after hearing it performed live in a temple by a group of visiting Tibetan monks. She feels that CD and internet renditions are completely different to the experience of listening to a live performance, where the vibrations of the chanting are reinforced by the temple and affect the listener physically. Although she has been a practicing Buddhist since her teens, knowing about chanting as part of meditation, she only introduced overtone chanting to her meditative practice within the last 5 years. She is self- taught and learnt though following instructions in books and through experimentation, so has always felt unsure as to whether she is doing the chanting correctly, but eventually felt comfortable with the chest resonance that the chanting produced.

Apart from the overtone chanting, she sings for herself only sometimes, but does not use her voice regularly for other singing as she feels she has a bad singing voice. She has had vocal training in the past for speaking, as her mother was a drama teacher, but she feels this training was more along the lines of correct elocution and did not extend into much expressive use of the voice. For her, Overtone chanting is a purely personal intervention and is not incorporated into her sound healing practice at all. Although she is well read on the practice of doing this and believes it to be efficacious, she does not have the confidence in her own vocal ability to use it for healing purposes. Chanting is done once a day in the morning for about 15 minutes, within her approximately 2- hour meditation process, which she does extremely regularly, as personal pressures make her feel that she, needs the grounding of the meditation. She does not always use overtones in her chant , but always incorporates the standard Tibetan chant words ‘Aum ma padme hum’, following the

precept of the Tibetan chant, of using words rather than just sounds, and she feels the vowels to be important in producing the resonant feel she enjoys. She uses the yoga lotus position as it is the correct position for meditation and opens the chest.

She has felt discomfort while chanting, which she feels may be caused by smoking rather than the chanting itself. This physical discomfort is experienced as a sore throat, and a feeling of light headedness. This is ascribed to getting breathless if not breathing properly for the practice. Her diaphragm becomes 'sore' and thus deep breathing is not always adhered to. In terms of emotional response, at times the chanting can make her cry, especially when she is emotionally stressed, in which case the voice breaks. She feels that the crying within the chanting as a meditative process is not a reaction against the chanting but a release, as though the practice gives permission to feel the emotion that is otherwise necessarily repressed due to life pressures. Her feelings following the session of overtone chanting are those of peace, (which she realises could also be ascribed to the entire meditative process). Colours seem brighter which she ascribes to the fact that sound and colour waves are close to each other in the spectrum and the chanting might focus the brain on this aspect. She also feels more balanced and wondered whether the chanting helped to balance the right and left brain. She referred to experiments she had read of in one of her many books on sound-healing, where Tibetan monks were assessed in an MRI machine whilst doing meditative chant, and the hemispheres of the brain were mapped, showing an increase in right brain activity.

She was not at all sure that the chanting improved the quality of her voice as she did not feel qualified to comment on this, but felt that the practice of chanting made her feel more grounded and that it was possible that it discharged nervous energy. She

commented that her husband noticed that she seemed more grounded after a chanting and meditation session.

The **second interview** was held with Chris Tokalon, who is a well-established voice-over artist, using throat singing as part of his repertoire. He is also a musician of long standing, specialising in the saxophone, as well as being a sound healer and a teacher of overtone singing. Because he is located in the Cape, the interview was conducted as a long-distance interview, beginning as a recorded Skype interview. However, the time lag on Skype caused problems, so the interview was concluded as a telephonic one. Due to problems with Mr Tokalon's computer he did not fill in the form himself and it was completed as part of the interview. Being a professional musician and experienced Saxophone player as well as voice artist and sound healer, he regards the two musical instruments he plays as being the saxophone and his voice. Vocally, in his profession, he uses mimetic ability to create a sound landscape where machines, animals and people are reproduced. He is also well-known for his use of throat singing as part of his performance. In terms of sound healing he takes clients on sound- healing journeys which incorporate the singing bowls and voice and sometimes a Monochord bed, which is a wooden box with 28 strings, all tuned to the same note, which give different harmonics when plucked, thus surrounding the client with harmonics to assist with a process of release. He teaches overtone chanting as part of this sound journey process as well as for personal development as a performative skill.

In his singing practice he seems to use Khoomei, Sygyt and Kargyraa, although he was not aware of the terminology. Initially he stated that he did not do the 'Tuvan thing' except for 'the deep voice one' (Kargyraa), but when he demonstrated it was

evident that he could perform all three. He has practised Bi-phonic singing and chanting for about 15 years, after being inspired by a CD of Rollin Rachele's Bi-phonic singing to start experimenting on his own, in order to contribute to his healing practice. He then attended a workshop by Nestor Kornblum to learn more about the singing from a live teacher. He has since practised on his own, aware of slowly developing in skill until he felt he had a breakthrough in this about a year ago which improved his capabilities through opening the throat. Thus he has had instruction but has also experimented a bit. His demonstration showed some good Sygyt whistle overtones, which he called 'head tones'. Being a voice-over artist, he uses his voice regularly in a performative way which, while not exactly singing, is beyond ordinary speaking, and could involve some elements of singing as he mimics different sounds. He uses his Overtone chanting and singing both professionally as a performer and as a teacher, and also for relaxation. He generally uses overtone singing on about three to five days a week. Although he meditates regularly in the morning after having a hot drink, the overtone singing is not necessarily a part of the meditation. He does not have a regular chanting or singing time but sings when he can fit it in, sometimes when driving, when he sings to the pitch of the engine. Each session is about twenty to thirty minutes, with meditation generally done in a sitting position, so if he chants while meditating it will be in that position. When demonstrating the practice as a teacher or performer, he will do this in a standing position. At times, on waking too early, he will sing overtones to send himself back to sleep, and will then sing in a lying down position.

He has experienced vocal discomfort with the *Kargyraa* voice and with his impersonations of Louis Armstrong (using Vocal Fry) and feels this is because the throat is wrongly tense. Generally with the *Kargyraa* voice the discomfort would be

felt at the beginning of the session. He feels strongly that the voice should be warmed up before attempting this and was slightly hesitant about the potential quality of his performance during the interview because he had not warmed his voice, because he had smoked a cigarette shortly before the interview and because he had a cold and blocked sinuses. All these were considered to impact on the final overtones. Physical sensation felt while chanting or singing overtones were those of resonance throughout the body. The emotional experience was that of a sense of wholeness, as though the voice was connecting to the physical and the emotional self. After a session of overtone singing or chanting he feels a connection between his body and his 'etheric' being and theorises that this is a process of entrainment, that the process of listening to the overtones will unite the physical body (regarded corresponding to the fundamental note) with the etheric body (seen as the overtones). This often has the effect of rooting him after a rough night with bad dreams. He sees the overtone singing as having a transformative effect not only on the singer but on a listener as well and shared the experience of an experiment conducted with him as the singer, where a psychologist connected a subject to an EEG and Mr Tokalon did Overtone chanting, whereupon the subject's brainwaves changed to meditation (alpha) state, thus suggesting that overtoning can induce a transformative state.

He feels that practice has improved his production of overtones and that the overtone singing has improved his voice in that it has become easier for him to sing for performance. His opinion is that this effect is probably due to the relaxation that the overtone singing gives him. In terms of benefits other than vocal, he feels that the years of overtone singing have gradually transformed him into a more rounded, confident and relaxed person. As a voice professional he feels that the practice of

Overtone singing would improve a student's voice, possibly due to improved breath support and control of the throat muscles. He felt that overtone practice must improve the resonance of the voice.

The **third interview** was conducted with Mr Christian Carver, a specialist in African musical instruments, who has a wide knowledge of musical performance and is based in Grahamstown, where he is at times in contact with the music department of the university. He is aware of the different types of Tuvan and Tibetan overtone singing and knows how to use them but bases his practice on the Xhosa "umngqokolo" throat singing, which uses tunes and melodies, and is based, like himself, in the Eastern Cape. He has practised this form of throat singing for about 10 years and learnt it through talking to and listening to performers and through his own experimentation. He sings regularly in styles other than throat singing with previous voice training through singing in church choirs. Throat singing is used neither as a personal intervention nor as a professional practice but rather to demonstrate "the limiting power of paradigms across cultures from a musical perspective." Although he has occasionally taught people to use overtone singing in the Xhosa fashion, he does not consider himself a teacher and does not think that everyone is a suitable candidate for throat singing, due to different shapes of the vocal tract. This singing is done intermittently and may be practised while driving or while demonstrating to learners. At each session he would probably sing for about 2 two to four minutes while standing.

Discomfort has been felt, usually after about 10 minutes of throat-singing, when he may at times feel pain in the larynx. Physical sensations were not noted. He is aware of singing the notes and hearing them and at times he is aware that the practice may

clear his sinuses. He is not aware of any emotional reactions but rather of a degree of concentration. There seems to be no awareness of physical or emotional reaction after the session of singing.

He feels that the practice of throat singing will not improve the voice as he considers the fundamental tone to be 'dirty,' i.e. containing a lot of extra frequencies, which are then amplified into overtones. He feels that the practice could in fact be damaging to the normal singing voice as if one sings overtones for a long period one can become hoarse and the throat can become painful. Benefits perceived through singing overtones are the demonstration of potential for extension of vocal capabilities and an awareness of overtone enhancements that can take place in the singing of vowels within regular practice. He feels that awareness of the music of different cultures causes a paradigm shift in the way we listen not only to ourselves but to all music, and is thus beneficial.

The **fourth interview** was held with a professional folk singer based in Natal, Miriam Erasmus, who also practices sonic healing through the use of her voice rather than through instruments. After she filled in a questionnaire, a telephonic interview was conducted. Ms Erasmus is able to perform *Khoomii* and *Sygyt* styles of throat singing. She has tried the *Kargyraa* voice but found it uncomfortable. She has also tried the Tibetan style chant but attempts this only as low in pitch as her voice will reach comfortably. She has practised overtone singing and chanting for about 14 years, having taught herself through Jonathan Goldman's book, "Healing Sounds." She attended a workshop by Nestor Kornblum but found it unproductive so has relied on experimentation and listening to develop her skill. Apart from Overtone singing she sings very regularly because it is her profession. She has been singing in public since her 20s and began without using a microphone, so has excellent vocal

projection. Her vocal training encompasses the field of both singing and speaking as she has a Licentiate in Drama, encompasses both the practical and theoretical aspects of vocal production. Overtone singing is used for personal ends rather than a professional performance; she is, however, very interested in the healing aspects of using overtones and has been practising Sound Healing since 2000. She uses her overtone singing to heal others and uses the singing as a dolphin uses its sonar. For this she uses western style overtone singing rather than Bi-phonic singing as she feels she is not adept enough at the separation of the tones. She states that singing vowels with the overtones as part of the final tone enables her to find blockages to physical or emotional health. She will sing vowels directed at the body of a client, scanning the body with her voice. She is aware that the notes she sings have full resonance and integrated overtones in normal practice, but when her toning reaches a part of the patient's body that is not in a state of good functionality, her voice will cease resonating and the tone will lose its overtones and produce a flat sound. In other words she is using the body of a patient as a sounding board and the imperfections in the sounding board are reflected in the resonant quality of her own voice. There is no regular pattern of chanting as it is done very intermittently as the mood or need arises. On receiving the questionnaire she had to practice for a while to enable her to regain her connection with producing the separate overtones. These intermittent Overtone sessions usually last a few minutes and are performed in a standing position as it is better for the breath support.

She has not felt discomfort in singing or chanting except when trying to find the correct note for the deep Tibetan chant, when there were a few seconds of discomfort at going into the growl voice. She is very aware of the fact that, being female, it is very difficult, if not impossible, to reach the depths of the Tibetan monks'

chant, but found a range that suits her and since then has experienced no discomfort. This range is a mid-range as she is a Mezzo-soprano. She feels that the notes she is able to reach when practising overtones are probably related to this range, which is a combination of her natural range and singing training, being a range of between the C below middle C**,** which to her is her 'growl' voice, to the third octave above that. She states that when she reaches her own 'growl' note she felt immediate amazement and wonder at this facility of her voice. Her physical experience while using overtones was that the deep and very controlled breathing takes a lot of effort, even for a trained singer. Trying to find the correct notes that do not strain the voice during production took some trial and error. Now, being practised, and having overcome the technical difficulties, she finds the resonance experienced through the whole body to be 'tingly.' In other words she is very aware of her entire body resonating. This results in a feeling, while overtone chanting or singing, of a connection with something 'cosmic and overwhelming.' After a session where overtone singing is used she feels exhaustion from the effort of the breath control, but exhilaration and a wonderful feeling of achieving a connection with 'everything.' This occurs when she uses the overtone singing for healing purposes, and the feeling of exhilaration arises when the toning has released a patient's 'block' and especially when this release enables a patient to talk about a block that was hitherto repressed. Her experience is that people become emotional when these blocks are starting to release and sometimes become defensive, as perhaps the origins of the blocks are humiliating in terms of social mores. Her theory is that the blocks are 'held' by the pineal gland, which she refers to as a black hole of emotion, which seems to suck in negative emotions. She feels that the vibrations of the overtones resonate in this gland and assist in releasing the negative energy. She has noted that when the overtones reach the high B flat above Top C which is used with

different vowel sounds and thus different overtones, there is a tremendous release of ‘blocks’ or repressed emotions, offered to her patients.

In terms of the effect on her own voice, Ms Erasmus feels that overtone singing does not really affect the quality of her voice as the style is so different. She is a Bel Canto singer and sings with an open throat, whereas she perceives overtone singing as requiring her to sing with a nasal tone. She feels that perhaps her own singing practise, which involves vocal usage for four to five hours every day, has enabled more ease with both her Western overtone singing and the Bi-phonic singing, as she is already vocally fit and has the core strength needed for overtone and squeezed throat production. Insofar as the benefits other than vocal of overtone singing are perceived, she feels that mastering the practice is a milestone overcome and is joyful at the empowerment this offers both to herself and to the patients who benefit from her practice.

The **fifth interview** was held with a practising and qualified sound healer, with a doctorate in music, and qualifications in Music Therapy, who also offers certificated courses in Sound Healing. Dr Wilna Dirkse van Schalkwyk has a sonic healing practice in the Magaliesberg area which involves the use of the Tibetan bowls, Ting Shas and gongs as well as the beneficial effects of overtone singing and chanting, and to this end she teaches the practice, both as part of a sonic training course she offers and also as part of a course in personal development through sound. The version of overtone singing she uses is Khoomei and she has been practising this for 12 years, having learnt it as part of her training in the UK, to become a Sound Therapy Practitioner. She followed this up by using books on the topic to help her practice. Apart from the overtone chanting she also sings regularly but had had no

vocal training before beginning her overtone training. She uses overtone chanting both as a personal intervention and as a professional practice, chanting on one to three days a week, with the time of day varying. The time span of her sessions varies from a few minutes, when using it to induce a meditative state, to up to ten minutes when using it during a Sound Therapy session for a client. When chanting for her to induce the meditative state, she sits upright, but when using the chanting for a client she will walk around the client.

Vocal discomfort can be felt when the voice is not sufficiently warmed up before doing the chanting and is experienced as tightness around the throat, early on during a chanting session, and also as a scratchy discomfort in the throat thereafter. While singing overtones she is aware of the sound vibrations being conducted by the bones in the skull, with this vibration then spreading through-out the body. Her emotional feeling when doing this is one of freedom and lightness of being. After a session of Bi-phonic chanting her whole being feels lighter and more open, due to the release of physical and energetic tension during overtone chant. Her physical senses also feel clearer. Energy flow improves, having a positive effect on all levels of her life.

Insofar as the perceived effect of overtone chanting on her voice, she feels that her singing voice has become richer and deeper through the years of practicing overtone chant. Other perceived benefits of Overtone chanting are that it has improved her experience of meditation since it helps to induce a meditative state. It also helps to clear her energy. As a Sound Therapist she uses overtone chant to help clients resolve energetic as well as physical blocks of energy.

8.2 Interview Findings – Summary

1. Types of overtone singing/chanting used

- Ms. Hoeller uses the Tibetan monk style chant.
- Mr Talon uses Khoomei, Sygyt and Kargyraa.
- Mr Carver is unsure of type used and feels he knows the Tuvan and Tibetan styles but is not very proficient. He practices mainly Xhosa "umngqokolo" throat singing.
- Ms Erasmus has attempted Khoomei, Sygyt, Kargyraa and Tibetan chant. She also uses Western style Overtone singing and toning.
- Dr Van Schalkwyk uses Khoomei.

2. Length of time Overtone chanting has been practiced

- Ms. Hoeller - 5 years
- Mr Tokalon – 15 years
- Mr Carver – about 10 years
- Ms Erasmus – 14 years
- Dr Van Schalkwyk – 12 years

3. Method of learning

- Ms. Hoeller learnt through reading books and experimenting.
- Mr Tokalon learnt through attending a course and being taught, then experimenting.
- Mr Carver learnt through listening to and talking to singers

- Ms Erasmus taught herself through Jonathan Goldman's book 'Healing Sounds', through listening and experimentation.
- Dr Van Schalkwyk learnt through training in the UK as a Sound Therapy practitioner using a teacher and books.

4. Regular practice of other forms of singing

- Ms. Hoeller sings sometimes only for herself.
- Mr Tokalon sings after a fashion using his voice professionally as an instrument.
- Mr Carver sings with a church choir.
- Ms Erasmus sings regularly as a professional folk singer.
- Dr Van Schalkwyk sings regularly.

5. Exposure to vocal training in the past

- Ms. Hoeller had elocution classes as a child but no extension of vocal production.
- Mr Tokalon had no formal vocal training but had a natural talent for mimicry which he developed himself.
- Mr Carver had singing training through the church choir.
- Ms Erasmus has trained as a singer and as a drama teacher.
- Dr Van Schalkwyk had no vocal training prior to overtone training.

6. Overtone singing as personal intervention or professional practice

- Ms. Hoeller uses chanting as a personal aid to meditation.

- Mr Tokalon uses overtone singing and chanting for personal relaxation and as a professional practice, selling his vocal prowess for voice-overs, and using it for sound healing and teaching overtone singing.
- Mr Carver uses overtone singing to demonstrate cultural aspects of music.
- Ms Erasmus uses overtone chanting and singing as a personal intervention and also as a sonic healer.
- Dr Van Schalkwyk uses overtone chanting and singing as both a personal intervention and as her professional practice.

7. Frequency of OT chanting/singing sessions

- Ms. Hoeller chants once a day.
- Mr Tokalon sings and chants 3-5 or even more days a week.
- Mr Carver sings overtones very intermittently.
- Ms Erasmus sings or chants very intermittently.
- Dr Van Schalkwyk chants every 1-3 days.

8. Time of day for OT chanting/ singing

- Ms. Hoeller chants regularly each morning.
- Mr Tokalon sings or chants when it can be fitted in, sometimes even while driving, or at times when sleep eludes him.
- Mr Carver sometimes sings in the car and at other times to demonstrate to students. There is no particular time of day.
- Ms Erasmus does not have a set time of day.
- Dr Van Schalkwyk may chant at variable times of day.

9. Length of chanting/singing session

- Ms. Hoeller – 15 minutes
- Mr Tokalon - 20 -30 minutes
- Mr Carver – 2-4 minutes
- Ms Erasmus a few minutes except for healing sessions when the voice can be used for over an hour
- Dr Van Schalkwyk a few minutes to introduce her own meditative state or up to 10 minutes when doing Sound therapy with a client

10. Position

- Ms. Hoeller sits in lotus position.
- Mr Tokalon sits for meditation, stands for demonstrations, and lies down if trying to sleep.
- Mr Carver stands for demonstration.
- Ms Erasmus stands for better breath support.
- Dr Van Schalkwyk sits upright for personal meditation but stands or walks around for Sound Therapy sessions with clients.

11. Discomfort felt?

- Ms. Hoeller – yes
- Mr Tokalon – yes – when initially doing Satchmo impersonation (kargyraa voice)
- Mr Carver - yes
- Ms Erasmus - yes

- Dr Van Schalkwyk – yes, when the voice is not warmed up enough

12. Type of discomfort felt and stage of vocal usage at which it occurs

- Ms. Hoeller feels a sore throat, light-headedness, sometimes breathlessness, an aching diaphragm when not breathing properly. She sometimes feels tearful and then voice breaks about 10 minutes into chant.
- Mr Tokalon can feel discomfort at the beginning of a session of Kargyraa voice.
- Mr Carver found that the larynx may become painful after about 10 minutes.
- Ms Erasmus felt discomfort for about 2-3 seconds when trying to get into growl voice (Kargyraa/ Tibetan chant). No discomfort reported for other forms.
- Dr Van Schalkwyk felt tightness around the throat area and a scratchy feeling in the throat afterwards.

13. Physical experiences while using overtone chant/singing

- Ms. Hoeller can experience a sore throat and light-headedness, sometimes breathlessness and an aching diaphragm.
- Mr Tokalon feels a resonance through the body if the mind and mood is right
- Mr Carver does not experience much physically. He is aware of hearing the sound and sometimes feels the sinuses may be cleared.

- Ms Erasmus finds that the deep and controlled breathing takes a lot of effort especially when using the voice for extended periods for healing. At first trying to find the right notes without straining the vocal bands was a process of trial and error and thus at times the vocal bands felt strained. With practice the resonance makes the entire body tingle.
- Dr Van Schalkwyk feels the sound vibrations conducted through the bones of the skull and then spreading throughout the body.

14. Emotional experience while chanting / singing

- Ms. Hoeller found that if emotionally stressed she may cry, which serve as an emotional release.
- Mr Tokalon feels a sense of wholeness, as though the voice is connecting the physical and emotional self.
- Mr Carver senses a degree of concentration but has no emotional reaction.
- Ms Erasmus feels a connection with something cosmic and wonderful.
- Dr Van Schalkwyk has a feeling of lightness and freedom.

15. Physical and emotional experience following a session of overtone chanting/singing

- Ms. Hoeller experiences a feeling of peace and balance. Colours may seem brighter.
- Mr Tokalon feels a connection between the body and the etheric being which benefits him when he has had a ‘rough’ night.
- Mr Carver has no input in this section.

- Ms Erasmus feels exhaustion from the intense breath control when using overtones for healing as the session is long, but is exhilarated afterwards with a sense of achievement at helping client release blocks.
- Dr Van Schalkwyk feels that her entire being is lighter and more open due to the release of physical and energetic tension. Her physical senses are clearer and energy flow improves, affecting all aspect of her life positively.

16. Opinion as to whether overtone chanting/ singing improve vocal quality in any way

- Ms. Hoeller is unsure as she feels she is not qualified to judge this.
- Mr Tokalon knows that the practice has improved his overtones and feels that it has improved his voice as it is easier to sing for performance. He feels that a vocal student would improve voice through breath support and possibly control of the throat muscles with awareness of tension and relaxation.
- Mr Carver does not feel that overtone singing can improve the voice in any way. He feels that it may damage the normal singing voice by causing hoarseness and pain. He does however have more of an awareness of overtones when singing vowels in a normal singing voice.
- Ms Erasmus does not feel that overtone chanting improves her voice as, being a Bel Canto singer her throat needs to be open and the Overtone chanting requires a nasal tone. She already sings 4-5 hours every day so is vocally fit without the overtone chanting.

- Dr Van Schalkwyk finds that her voice has become deeper and richer due to years of overtone chanting.

17. Perceived benefits other than vocal received from practice of overtone chanting/singing

- Ms. Hoeller feels more grounded as though her nervous energy is discharged
- Mr Tokalon feels that it has over time transformed him into a more rounded, confident and relaxed person.
- Mr Carver feels that singing overtones gives him a ‘party trick ’to attract attention, change in perspective regarding cultural paradigms in music.
- Ms Erasmus finds that mastering the technique of overtone singing and chanting is an achievement, a milestone joyfully overcome.
- Dr Van Schalkwyk finds that the chanting has improved her experience of meditation as it helps to induce the meditative state and helps to clear energy. In her sonic healing practice the overtone chant serves to help clients release blocks.

8.3 *Results and Discussion*

With regard to the type of Overtone singing or chanting used it was found that the small representative group used the full variety offered in the questionnaire, which were deemed to be the varieties of throat singing offering a full bi-phonic experience. Only two perceived themselves to be using the Deep Tibetan style chant, one, Ms Hoeller, using it regularly as part of meditation and the other, Ms Erasmus, using it as an occasional foray into experimentation. The perception of this form of chanting, which initially seemed to offer possibilities for vocal training due to the potential relaxation offered by the meditative aspect, was that the deep tones were initially not attractive to the ear and that the effort in producing these tones was too great. Tuition is not readily available for this form, even on the internet. Jonathan Goldman explains that the monks who use this form of overtone chanting do not teach it to the general public. Because of the powerful words of the Tantric mantras, the chant is only taught to initiates and, when chanting in public, the words of the mantras are often garbled, to make it difficult for those who have not served a long apprenticeship to imitate correctly. Yet the technique of the chant is not specifically taught even to initiates. When the words of the specific mantras are known the chant is learnt through listening and mimesis (Goldman, 2002).

One of those interviewed, although knowing of the forms of Overtone singing and chanting under investigation, did not use them, but was more focused on the Xhosa overtone singing.

Only one, Mr Tokalon, a male, used the deep, growl-like tones of Kargyraa fairly regularly, to extend his range of vocal usage for unusual voice-over work, while Ms Erasmus had tried it but found the deep tone unsuitable for her voice.

Mr Tokalon and Ms Erasmus used the *Sygyt* style of overtone singing enjoying the flute or whistle-like overtones produced, while these two as well as Dr Dirkse van Schalkwyk also used *Khoomei*. Khoomei is easier to produce, being closest to the Western style of overtone chanting, which is not performed with a squeezed throat and relies more on vowel production and awareness of overtones as part of the resonant sound rather than separation of them. As Dr Dirkse van Schalkwyk uses and teaches Overtone chanting to people who are potentially not experienced in the practice of voice, it would make sense to focus on the style of overtone singing that is easier to produce.

Most of those interviewed had practiced overtone singing and chanting for a long time, from 5 to 15 years. This seems to indicate that once the practice has been mastered, it seems to benefit the user, although all remembered, long after initiating the practice, that the learning process could occasion discomfort.

Only two of those interviewed had received any form of personal training, which was followed by reading and listening to CDs (before-You Tube instruction became common), the latter methods being the only methods that the other three used to learn. As the aural method of learning is that used by the Tuvan singers and by the Tibetan monks, it seemed a valid way of learning.

All of those interviewed regularly practiced other forms of singing, although the use varied, from singing only for personal enjoyment to recreational use in a church choir to professional use as a singer. This indicates that all those interviewed were in the

habit of extending the use and range of the voice and would have some practice in controlling the muscles used in vocal production and in using the ear for tuning.

This practice could have been enhanced by vocal training, but it was seen that only two had any training in extended vocal usage. Ms Hoeller felt that her training was limited to elocution, but even this could pre-dispose a person to use the organs of articulation (those same organs that alter the shape of the resonator) with more awareness and muscularity. Mr Tokalon had no formal training but his talent for mimicry from an early age and his drive to practice this would have served as a training ground for the muscularity of the organs of articulation as well as developing the ear. Dr Van Schalkwyk, in spite of having no formal training in the vocal arts had training in music which would have developed a more sensitive ear for the practice of Bi-phonic vocalisation.

Four of those interviewed used the bi-phonic chanting and singing as a personal intervention for relaxation, including as an aid to meditation. Of those, three also used vocal chanting for healing, although Ms Erasmus did not use bi-phonic vocal overtones for healing, but the more sonically integrated western overtone singing. As well as using bi-phonic voice for healing, both Mr Tokalon and Dr Van Schalkwyk used Bi-phonic voice professionally, as teachers of the practice, while Mr Tokalon was the only one who used the practice as a performance art.

The frequency of chanting or singing sessions and their duration could be heavily influenced by the use to which the practice is put. Frequency varied from Ms Hoeller's regular daily vocal start to her meditation to Mr Tokalon's practice on many days of the week to Dr VanSchalwyk's chanting only every one to three days, with the others only singing intermittently. Ms Erasmus stated that when interviewed she had to practice rusty technique which had not been used for many weeks.

The time of day for practice was variable. Ms Hoeller, using her chanting for personal release and grounding, was very regular in her time for practice every morning, whereas the others interviewed tried to fit the practice in to wherever it would fit in a busy schedule, to the point where two sometimes practiced while driving. Jonathan Goldman is reputed to advise people to use overtone singing with care when driving, as a meditative state could be dangerous (Nielson, 2000, p107). Personal experience reveals that the concentration needed for listening for the overtones can draw attention away from what was happening on the road.

The length of time for practice of the Overtone singing or chanting also varied considerably according to the users' need. Two who used chanting to introduce a meditative state varied from a few minutes to 15 minutes. Mr Carver, practicing for interest only, would sing for only two to four minutes, while Mr Tokolan, practising for professional usage as well as using the overtones for meditative purposes, would spend twenty to thirty minutes at a time on his Bi-phonic singing. Ms Erasmus had the most fluctuation in her use of overtone singing, varying from a few minutes to over an hour, but later confirmed that her long healing sessions actually used western overtone singing rather than Bi-phonic although she was very aware of using the vocal cavity and vowel sounds to enhance the overtones integrated with the fundamental.

The position adopted for singing was also very variable, ranging from sitting for meditation to standing for demonstration and teaching or, in the case of Ms Erasmus, for better breath support. Mr Tokalon also advocated the lying down position if using the relaxing vibrations to help send oneself back to sleep after waking up during the night.

All those interviewed had felt discomfort at some stage of using bi-phonic voice.

The type of discomfort felt was generally in the throat, being variously described as a sore throat, a painful larynx, a tight throat with a scratchy feeling in the throat afterwards. Ms Hoeller also sometimes had a feeling of light-headedness and an aching diaphragm, both of which she realised had its roots in her lack of training in terms of breath support. She had commented that the *Tibetan chant* needed enormous amounts of breath and noted that Tibetan monks she had encountered all had well developed rib cages, akin to the barrel chests of old fashioned actors who practised almost permanent rib reserve breathing. It would seem that the discomfort is not limited to the beginning stages of learning the techniques but also occurs when one is practiced. Mr Tokalon reported discomfort at the beginning of a *Kargyraa* session even currently, and would prefer to warm his voice up before using bi-phonic voice. The *Kargyraa* voice, or lower tones of the Xhosa "*umngqokolo*" singing seem to occasion more discomfort than other forms of bi-phonic singing. Personal experience of attempting *Kargyraa* voice has always resulted in discomfort within a minute of the attempt. It is clearly a common problem, as various online instruction courses, such as the Tuvan Throat Singing Yahoo Group, advise those practising to give their voices a rest as soon as discomfort is felt. Further investigation is needed to ascertain whether the discomfort felt would be due to the unaccustomed use of the ventricular folds, or to the possibility that the extra force of breath needed to set the ventricular folds vibrating may irritate the vocal folds and cause some inflammation there. .

Other reported physical experiences ranged from the discomfort of producing the sound to the more pleasant feelings of resonance throughout the body and the feeling from Mr Tokalon that the practice affected mood through this. It will be seen from Mr Tokalon's interest in the Monochord bed that the awareness of the potential

for vibration of overtones to affect the well-being of the body could stimulate an intellectual awareness of this factor while chanting. Dr. Van Schalkwyk likened the path of the resonance to Lessac's conception of the spread of resonance through the bones of the face and head and thereby to the entire body through the bony structures of the body.

Whilst emotional reaction to the use of Bi-phonic voice cannot be scientifically proven, it does have some bearing on the suitability of the practice for vocal training, as practices that affect the mood and emotions can cause or relieve blocks to vocal production. Ms Hoeller found that using her *Tibetan chant* could stimulate a tearful state, felt to be an emotional release which cleared her energy for the day ahead. Although no tears were reported by the others interviewed, theirs was a general feeling, except for Mr Carver's, that using bi-phonic voice stimulated a positive emotional response, leading to a feeling of freedom or to connection with aspects of the self or to the cosmos. Mr Carver was aware of a feeling of concentration without emotional response. It is possible that if the intention is relaxation and healing of the psyche then the effect will be such, whereas if the intention is intellectual stimulation than the effect will likewise be such.

The question as to whether Overtone chanting or singing improved vocal quality also showed disparate opinions. Ms Hoeller felt insufficiently qualified in the field of vocal production to offer an opinion. Two people interviewed felt that the practice of bi-phonic singing did not improve vocal quality. In fact Mr Carver felt that it had the potential to damage the voice because hoarseness and pain in the larynx could indicate damage to the vocal apparatus. Ms Erasmus felt that her usual singing voice was unaffected because she uses a different style of voice for her singing, using an open throat, and is already vocally fit, so she does not feel that the breathing

requirements of Bi-phonic singing contribute to her breath control. It must be noted in this regard that Ms Erasmus does not use bi-phonic voice in a regular manner. Only two felt that their voices had benefited from the practice, Mr Tokolan feeling that his general production of overtones in ordinary singing had improved and Dr van Schalkwyk noting that the years of Bi-phonic chanting had allowed access to deeper tones so that her voice had become deeper and richer. Mr Tokolan felt that students of voice would benefit from the development of breath support and also the control of the throat muscles with more awareness of tension and relaxation in this area.

Other perceived benefits of Overtone chanting or singing were generally positive with comments from Ms Hoeller and Dr van Schalkwyk that nervous or negative energy was cleared, leaving both in a calmer, more grounded frame of mind, conducive to meditation. Mr Tokolan also felt that the practice had, over time, had the same effect for him, making him generally more confident and relaxed and that a session of concentrated production of overtones had an immediate calming effect for him. For Ms Erasmus the positive effect was joy at the mastery of a different technique, and this was echoed in a milder way by Mr Carver as satisfaction at his ability to do his ‘party trick’ and a satisfaction in extending his understanding of music.

Chapter 9 CONCLUSION

This study has discussed vocal needs for professional voice users and the methods used by trainers and noted that a problem often encountered in training is that of ‘blocks’ to optimum vocal production. The need was shown for an ongoing search for new methods of extending training methods to assist in overcoming these blocks. Because vibration is an integral part of vocal production, the physics of vibration as they relate to vocal production were investigated. This was extended to an investigation into how the physics of sound production relate to the human physiology, in order to better understand the potential for blocks to vocal production. As part of the search for new methods, Bi-phonic voice was explored in terms of its historic and sociological origins as well as its physical and physiological methods of production.

What emerged from the investigation was that one cannot just consider Bi-phonic voice as one method of extending vocal training. Because Bi-phonic voice is also termed ‘throat-singing,’ many forms of throat-singing were needfully explored and it was found that some ‘throat singing’ was not always performed with only one person creating the bi-phonic effect. The styles of throat singing that are more truly bi-phonic are the Tuvan throat singing, the Tibetan chant and the Xhosa “umngqokolo” singing. In terms of investigating suitability as a training method, more scientific research is available for the Tuvan style of Bi-phonic voice and for the Tibetan chant, so these styles were more specifically researched. Even within this narrowed field, there are tremendous variations in the use of the voice, as there are three main different styles in the Tuvan throat singing, with the Tibetan chant as a fourth variation, resembling one of these styles. (Levin, 1999)

What is common to the four styles under consideration is that the throat is constricted in order to produce the bi-phonic effect (Klingholz, 1993) (Sakakibara, 2001). In terms of standard western vocal training this tensed throat could seem problematic, as most training seeks to avoid throat tension for the reason that tension in the extrinsic muscles of the larynx can cause tension in the intrinsic muscles, which may restrict the range of the voice to the upper range due to the tension of the vocal bands (Eisenson, 1979, p77). In throat singing, however, this does not appear to be a problem as the fundamental note is generally a low drone, indicating that with training, considerable finesse in isolating tensions in the throat may be achieved. This training in finesse would be essential, as throat tension can also affect the tension of the pharynx which, in normal spoken practice, can have the effect of restricting some of the integrated overtones and producing a harsher sound.

The goal in conducting the research was to assess the suitability of Bi-phonic voice for serving as an addition to standard vocal training for professional voice users. The hope was that the practice could assist in increasing the range of the voice which would make vocal use more flexible. It was also hoped that the potential would be there for the extended overtones and the possible meditative aspect of the practice to assist in removal of blocks to optimum vocal production.

In terms of the extension of range, it would seem that the user of Bi-phonic voice is exposed to a greater range and, when practiced, can use a greater vocal range but this range is generally only physically accessible through the constriction of the throat and the splitting of the fundamental note from the overtones (Levin, 1999). The very high whistle tones and very low undertones achieved with this bi-phonic production would possibly not be accessible to the normal speaking voice without a break in fluency to access a different performance mode. However, it is possible that the

exposure to these separate overtones and undertones could train the ear in a different way. Even listening to others performing the throat singing technique educates the ear to listen to the two separate tones simultaneously. The effect of entrainment (Braine, 2006. P18-20) has the potential for subconsciously encouraging the voice to achieving a range beyond the usual, even if the extremes of the Bi-phonic range are not reached.

The attempt to perform the separate overtones forces the performer to listen more intently and to become acutely aware of the tongue and lips as modifiers of the overtones. This usage and awareness could serve as an additional training tool not only for muscularity of the organs of articulation, but for extreme sensitivity as to the tonal effect thereof.

A positive addition to vocal training could be the breath requirements of Bi-phonic singing. Both the Tibetan chant and the Tuvan singing require excellent breath support and control. The ‘chest’ voice required to stimulate production of the fundamental, with the throat already squeezed, requires a greater attack with the breath. It was noted that the Tibetan monks had developed large rib cages to enable greater capacity for their ongoing chanting. It was noticed in watching videos of Tuvan singing that shorter passages are sung, with a strong inhalation before the next passage. It is possible that the traditional Tuvan restrictions on female throat singing due to the possibility of barrenness (Levin, 2002, p199) could arise from the breath support requirements, which would require extreme contraction of the transverse abdominal muscles and strong use of the pelvic floor. One could raise the hypothesis that, in an animistic society, where mimesis of a desired state was felt to assist in achieving that state, it might have been felt that this contraction of the belly area ran counter to the desired fullness of the belly area. Women do now perform

throat singing and also bear children, so it is clear that there is no adverse effect on child bearing. However the need for good breath support has been noted and the breath requirements for this could be of benefit in standard vocal training.

In terms of the release of blocks to vocal production, it was felt that the meditative state of Tibetan chant would be an effective relaxing practice. Mr Tokalon stated that it seemed to him that the fundamental tone seemed to relate to his physical being while the overtones seemed to relate to his ethereal being. This indicates a dual awareness of the physical and emotional state. Ms Hoeller felt that the overtone production had an effect of aligning the right and left brain to leave the chanter feeling more balanced.

Release to vocal blocks could also be affected by the stringent demands on the breathing. Deep breathing can release both physical and emotional blocks and it was noted by Ms Hoeller that the meditative chant could make her tearful as a release. I have noticed in training voice that access to deep breathing can often result in a tearful release, so a practice that stringently requires deep breathing could be beneficial in these terms, with distancing provided by the concentration needed for the production of the overtones.

The resonance that was felt in the entire body was reported as a positive feeling and, while the effect of resonant tones on the muscles of the body needs more academic research, it is an accepted theory amongst sound healing therapists that different tones can resonate in the body to effect release. Based on the feedback from those interviewed and from the literature, it would seem that while the meditative state is good for release of negative energy and for relaxation, and achieving this state through the use of overtone singing enhances this effect, the achievement of this state through the Tibetan chanting is not so easily reached, as training in Tibetan

chant seems to be restricted to initiates. It is possible to learn this through mimesis but the danger of vocal damage is there.

In analysing the interviews it was found that discomfort was felt by all in the learning stages, but it was Kargyraa voice and the Tibetan chant that seemed to produce some vocal discomfort even after years of exposure to the method. As these two forms of throat singing rely on the vibration of the ventricular folds (as well as the aryepiglottic folds in Tibetan chant) to produce the undertone (Sakakibara, 2004) and it is not known whether it is the ventricular folds that are feeling the discomfort or the vocal folds themselves, exposed to a stronger flow of air in the effort to vibrate the ventricular folds, it may be well to approach use of this technique with care until further research rules out vocal fold damage.

The *Khoomei* and *Sygyt* styles of bi-phonic vocal production seemed to occasion less discomfort and it seemed to be the *Khoomei* style that was generally found easier to perform. This would result in the style being more comfortable, once learnt. Although the whistle overtones are considered a desirable goal, *Sygit* is generally accounted more difficult than *Khoomei* due to the specialised throat constriction and the degree of tongue control. The *Khoomei* vocal production, closest in production to the Western Overtone singing, has a resemblance to Lessac's Y-Buzz, which, although not specifically using a pressed throat, seems at times in practice, due to the position of the tongue for the Y sounds and the movement around this sound, to come very close to producing separate overtones.

Members of Nielson's overtone chanting research group reported concern with doing the technique correctly but only two had a small amount of vocal strain in the beginning for the overtone chanting they practiced. All had, however, taken part in a short training course with Nielson to ensure that the technique was learnt (Nielson,

2000, p124-140) and according to further correspondence with Nielson, the practice was *Khoomei* based.

It would seem then that the concern that vocal damage could come from the untrained practice of Kargyraa and Tibetan chant. The literature on Kargyraa voice production does not specifically indicate vocal strain but, because there are some audible similarities to Vocal Fry and to the growl voice of Extreme Metal music, both of which can cause problems with the vocal folds that require 'time off' from speaking, it is felt advisable to approach these practices with care. Tsai et al (2010) note the possibility of vocal fold damage with growl voice, but also show that the breath requirements for Growl voice cause strong contraction of the Transverse Abdominal muscles, which has a spine strengthening effect. It is thus possible, although not yet proven, that the same beneficial effect might be provided by Kargyraaa voice and Tibetan chant. We can see therefore that there may be advantages in terms of strengthening of posture, extended range, chest resonance and breath control, but perhaps personal training by an expert rather than internet videos and mimesis would be indicated.

Deducing from the above discussion, it is possible to conclude that while there could be distinct advantages to including the practice of Bi-phonic voice in a training programme for professional voice, care should be taken in the implementation thereof. It would not be a 'quick fix' or short cut to vocal technique, but an extension to training that works through the body, hearing and vocal apparatus. Much practice is needed and mastery takes many years. Using Bi-phonic voice does not replace a vocal warm-up but actually requires a vocal warm-up before using the technique. Although aspects of the technique can be learnt by mimesis, it is possibly better to undertake some training in order to avoid vocal strain.

Chapter 10 THE WAY FORWARD

Because of the potential benefits if the techniques are used correctly, and also the potential for vocal strain if the practice is incorrectly implemented, it is felt that further and fuller separate investigation into each of the branches of Bi-phonic voice, in terms of inclusion in vocal practice, would be beneficial. The researchers into Extreme Metal Growl voice have noted head and body position as well as lip position as affecting the pitch of the growl (allied to the scream) (Smialek, 2012, p2). This aspect of pitch has not been specifically noted by the researchers into the various forms of throat singing, who seem to focus more on the vocal, laryngeal and aryepiglottic folds, and the acoustic s related to those, yet this aspect has a decided effect on the formants as noted by Newham (1999 a & b).

Because it is also not known in scientific terms what effect vocal vibration can have on the muscles of the body in terms of the resonance of various pitches, it is felt that further research in this area would lend credence to the writings of those interested in the sound healing field, which may affect vocal production.

When such a fusion of research is available we can look forward to a fuller knowledge of the potential not only of Bi-phonic voice but of other forms of vocal resonance in the training field.

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Appendix A

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QUESTIONNAIRE—Overtone Chanting (2 pages)

Date:_____
.
Name_____

1. . What form of Overtone chanting do you do (or have you done in the past)?

    a. Xoomii, - fundamental with overtones – mid tone
    b. Sygyt, - fundamental drone with whistle overtones
    c. Kargyraa- very low voice (growly) with some melody,
    d. Tibetan monk-style chant – low pitch generally held on a single note

    e. Other - describe
    _____

    _____.

2. How long have you practiced Overtone chanting? _____

3. How did you learn to do overtone chanting? –

    Teacher /internet / books / experimentation

4. Apart from Overtone chanting, do you sing fairly regularly? _____

5. Have you had voice training in the past? _____

6. .Do you use Overtone chanting as a personal intervention or as a professional practice ?

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7. How often do you chant? Once a day/more than once a day/ on 3-5 days per week / on 1-3 days per week / very intermittently

8. When do you chant each day? _____

9. Approximately how long do you chant at each session? _____

10.. Do you sit / stand / lie down / move

11. Did you at any stage experience vocal discomfort in your chanting? _____

12. If so describe the feeling and at what stage of chanting it occurred.

_____

_____

13.. Describe your physical experiences while chanting overtones.

_____

_____

_____

14. .Describe your emotional experience **while** overtone chanting.

_____

_____

_____

15.. Describe your physical and emotional experience **followin**g a session of overtone chanting with regard to self, others, environment, creativity, etc,

_____

_____

_____

16.. Do you feel that overtone Chanting improves the quality of your voice in any way?

_____

17. Do you feel that the practice of Overtone Chanting has benefited you in any way other than the potential vocal benefit above? Clarify.

_____

_____

_____

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